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KERATOCONUS WITH REPORTS OF CASES.[1]

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(With one drawing in text.)

KERATOCONUS is an affection of early adult life, seldom beginning before the age of fifteen years, and seldom after the age of thirty. It is said to affect women more frequently than men, but of the 15 cases reported here, 8 were men and 7 were women.

The cause of keratoconus is unknown. Bowman found keratoconus in several members of the same family, but similar observations have not been reported by others, and it is doubtful that heredity is a factor. Parisotti,[2] who made quite an extensive study of the subject, is of the opinion that it is due to a "diminished resistance of the central portion of the cornea, which renders it incapable of bearing the normal intraocular pressure. The cause is congenital, probably due to some defect in the structure of the central corneal tissue." He assumes that the elastic fibers are wanting. Lapersonne, in discussing Parisotti's paper, stated that he considered conical cornea to be a "congenital or acquired dystrophia, possibly from an affection of the sympathetic."

Anatomic Findings: Salzmann[3] examined a cornea with keratoconus microscopically. Thickness at the apex of the cone, $\frac{1}{3}mm$. Anterior epithelium and Bowman's membrane

[1] Read in part at the meeting of the American Opthalmological Society, Washington, D. C., 1913.

[2] *Trans. Soc. française d'ophtal.*, 1909.

[3] *Centralbl. f. prakt. Augenheilk.*, March, 1906.

broken here and there, the gap being filled with scar tissue. This tissue was also present between Bowman's membrane and the epithelium. The deeper layers of the substantia propria were normal. Descemet's membrane was defective in places. Newolina examined a small portion of the apex of a cone. The opacities visible were found to be "due to thickening of the epithelium and to proliferations of connective tissue growing from gaps in Bowman's membrane." Uhthoff examined the eyes of an individual in whom keratoconus had recently developed. "Descemet's membrane was normal in one and ruptured in the other. The epithelium varied in thickness in the center of the cornea, but was normal at the periphery." He agrees with Axenfeld and others in the belief that the rupture of Descemet's membrane is the result, not the cause, of keratoconus. Erdman[1] examined keratoconus in an eye from a patient fifty-two years of age. There was marked thinning of the corneal tissue. Descemet's membrane was thickened in this case.

In regard to the opacities that appear at the apex in advanced cases, Collins and Mayou[2] state that many cases are due to a rupture in Descemet's membrane and its endothelium, through which aqueous humor filters into the cornea, causing it to become edematous.

In the beginning keratoconus is rather difficult to recognize. There are four principal objective methods for arriving at a diagnosis:

1. Observation with the ophthalmoscope, which will disclose a myopia at or near the center of the cornea, much greater than at the periphery of the cornea and a distortion of the retinal image, which distortion changes as the portion of the cornea through which the fundus is observed changes. Observed with the plane mirror, the apex of the cone, when the patient looks at the source of reflected light, gives a bright reflex surrounded by changing concentric shadows on slight movement.

2. The retinoscope, which gives the effect of irregular astigmatism, the reflex from the cornea being small at the apex of the cone, and elongated into an irregular wedge-

[1] *Graefe's Arch.*, vol. xxvi, p. 88.

[2] "System of Ophth. Practice," Pyle, *Path. and Bact.*, p. 510.

shape at the sides of the cone, the base being toward the periphery of the cornea.

3. The keratoscopic examination, by means of Placido's disk, which is well illustrated in the plate by Perot[1] the image of the disk figure being elongated and broadened toward the periphery of the cornea.

4. The ophthalmometer. This is probably the most sensitive test for the detection of keratoconus in its very early stage, provided the mires are of suitable shape and size. The mires furnished with the instruments of Javal, having the black line running through the center in the direction of the axis of the arc, are well suited for the purpose. When keratoconus is observed in its very early stage even, it will be found that a meridian in which the central dividing lines of the mires when their images are brought into apposition fall in a straight line does not exist (Fig. 1). The cone is not a segment either of a sphere, an ellipsoid, or a parabola, but a mixture of all. The line of the image of the mires is broken at their intersection and frequently slightly curved. The deflection of the lines of the mires at either side of the middle is in the direction of the torsion of the line of least curvature when the radius of that approximate meridian is measured, and in the direction of the line of most acute curvature when the radius of that approximate meridian is being measured, while the images of the mires are broadened in the direction of least curvature. If the image of the combined mires is sharp at their opposing margins, it will be blurred at the margins of the extremes of the image, the blurring being greatest in that portion of the image lying in the direction of the most acute curvature, because that portion will be most out of focus. The lines of the images are not irregular in the early stage, consequently cannot be confounded with the images of the mires seen in irregular astigmatism due to corneal ulcer or injury. Another point of differentiation

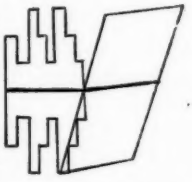

FIG. 1. Approximate distortion of image of Mires in Keratoconus.

[1] Norris and Oliver's *System*, vol. iv., p. 250.

is the binocular character of keratoconus. The principal meridians in keratoconus are seldom at right angles, the difference ranging from 1 to 10 degrees. As a rule, the apex of the cone is reached by a more acute curve above than from below, due apparently to the supporting effect of the upper lid to the tissue of the cornea, but the meridian of greatest curvature is seldom directly vertical in its upper half; in fact, it may be found to be at least 45 degrees to either side, sometimes even lying nearer the horizontal meridian.

Pulsation.—Not infrequently, even in a comparatively early stage, pulsation of the apex of the cone may be observed by examination with the ophthalmometer. This is, of course, synchronous with the pulse. The variation in level seldom exceeds $\frac{1}{8}mm$. The pulsation is largely confined to the stage of progression. I have no record of having observed it in cases that have been stationary for a period of three years or more.

Another peculiarity is that the degree of astigmatism and the axes as determined by the opthalmometer seldom correspond with those found by means of the trial-lenses.

The following are brief histories of cases observed not requiring operation: The readings from the opthalmometer indicate axes of meridians of least curvature as nearly as could be ascertained.

Case 1.—Mr. H. C. F., aged eighteen years, came to my office February 22, 1895. Has grown rapidly—now 6 feet 2 inches tall; is slim, but apparently in good health. Vision has been failing during the last three years. Has attended school quite regularly, but has not used the eyes excessively.

Status Præsens.—Small crescent, possibly myopic, at temporal side of each disk. Fundus of each eye normal. Ocular muscles—exophoria, 4°; left hyperphoria, 3°. The distorted images of the mires were quite marked.

R. E.: Tn. Ophthalmometer 1.5 D.; axes not regular. V. with — 4.75 s. ⌒ — 1.5 c. ax. 60° = $\frac{20}{70}$.

L. E.: Tn. Ophthalmometer 0.5 D.; ax. not regular. V.; with — 0.75 s. ⌒ — 0.75 c. ax. 130° = $\frac{20}{20}$.

April 2, 1900; V. R. E. = 4.5 s. ⌒ — 2 c. ax. 30° = $\frac{20}{50}$ +; L. E. — 1.25 s. ⌒ — 1.12 c. ax. 117° = $\frac{20}{20}$.

March 19, 1905; V. R. E. — 4.25 s. ⌒ — 2.25 c. ax. 30° = $\frac{20}{70}$; L. E. = 2.00 s. ⌒ — 2.75 ax. 160° = $\frac{20}{40}$ +.

May 2, 1907; V. R. E. — 5. s. — ⊂ 2.5 c. ax. 35° = $\frac{20}{40}$; L. E. — 1.5 s. ⊂ — 4.5c. ax. 154° = $\frac{20}{40}$

April 14, 1912; V. R. E. — 4.5 s. ⊂ — 2.5 c. ax. 23° = $\frac{20}{100}$; L. E. — 1.5 s. ⊂ 4.5 c. ax. 157° = $\frac{20}{50}$.

In this case the vision in seventeen years fell from $\frac{20}{40}$ to $\frac{20}{100}$ in the right eye, and from $\frac{20}{20}$ to $\frac{20}{50}$ in the left, with marked increase in the astigmatism in both eyes, the peculiarity of the corneal images increasing in both eyes. The affection began at the age of fifteen years; the development in both eyes virtually ceased at the age of thirty years.

CASE 2.—Mr. S. M. B. came to my office March 16, 1895. The condition of refraction was: V. R. E. — 5 c. ax. 75° ⊂ + 7 c. ax. 158° = $\frac{20}{40}$ —; L.E. — 6 c. ax. 132° ⊂ + 6 c. ax. 38° = $\frac{20}{40}$ +. Tn. The characteristic images of the mires were observed on examination with the opthalmometer. The patient has not been seen since.

CASE 3.—Mr. S. L. N., aged thirty-seven years, came to my office April 6, 1907, referred by Dr. Posey, of Philadelphia. Has had difficulty in the use of the eyes for six or seven years. Has not obtained relief from the use of glasses. Sees well if he makes a stenopaic slit of eyelids. Has quite severe dull pain back of eyeballs, accompanied by nausea on use of eyes. Six months ago the refraction was: V. R. E. + 1.25 c. ax. 145° = $\frac{20}{40}$ +; L. E. + 0.50 s. ⊂ + 0.50 c. ax. 30° = $\frac{20}{30}$.

Status Præsens.—The ophthalmometer measurements are: R. E. Astigmatism 3.25 D., lesser axis 45°; L. E. 3.5 D., lesser axis 153°. Principal axes are not at right angles. The distortion of the images of the mires described above was very evident. R. E. — 2.5 c. ax. = $\frac{20}{30}$; L. E. — 0.50 s. ⊂ + 3 c. ax. 25° = $\frac{20}{30}$.

The optic disks in both eyes present an excavation of about 0.4 *mm.* Tn. in both eyes. Fields of vision not limited.

CASE 4.—Mr. H. Z., aged twenty-eight years, came to my office July 28, 1907. Vision began to be difficult five years ago. Patient is in good health. Has used the eyes excessively for close work. The affection probably began at about the age of twenty years.

Status Præsens.—Cornea clear. V., with correction, R. E. = $\frac{12}{200}$; L. E. = $\frac{10}{200}$. Opthalmometer: R. E. Astigmatism 8 D.; axis 97°; L. E. 8 D.; axis 80°. The peculiar distortion of the images of the mires pronounced. V. R. E. — 1.5 s. ⊂ + 8.75 c. ax. 30° = $\frac{20}{50}$ —; L. E. — 0.50 s. ⊂ + 8.25 c. ax. 180° = $\frac{20}{70}$. Fundi normal. Tn.

October 21, 1907, the vision and condition of the eyes were virtually unchanged.

CASE 5.—Mr. A. L. S., aged twenty-one years, came to my office November 22, 1907. Patient has noticed that his vision was imperfect for four or five years. Has never been robust, but has not had any severe illness. Has been studying hard for some years.

Status Præsens.—Cornea clear. No pathologic condition of the interior of the eyes. Opthalmometer: R. E. = Astigmatism 4 D. ax. 45°; L. E. 3.25 D. ax. 130°. Principal axes not at right angles. The peculiar distortion of the image of the mires is pronounced. V. R. E. + 3 c. ax. 110° = $\frac{20}{100}$ +; L. E. — 0.50 s. ⌒ + 3 c. ax. 28° = $\frac{20}{30}$.

April 7, 1909: V. R. E. + 3.5 c. ax. 123° = $\frac{20}{100}$; L. E. — 0.50s. ⌒ + 3 ax. 28° = $\frac{20}{30}$. Conical cornea very nearly stationary.

CASE 6.—Mrs. E. J. Van D., aged twenty-two years, came to my office February 17, 1908. Has had difficult vision for a number of years. Patient in rather feeble health.

Status Præsens.—Cornea clear. Fundi normal. Ophthalmometer: R. E. Astigmatism 2.25 D. ax. 50°; L. E. = 8 D. ax. 135°. Principal axes not at right angles. Distortion of image of mires marked. Refraction: V. R. E. — 2 s. ⌒ 2. 25c. ax. 50° = $\frac{20}{70}$ —; L. E. — 3 s. ⌒ — 6 c. ax. 132° = $\frac{20}{300}$ —. Tn. The change taking place in the cornea is slight.

CASE 7.—Miss E. T. D., aged sixteen years, came to my office October 17, 1908. The difficulty with vision began at the age of ten years. Patient pale, somewhat anæmic.

Status Præsens.—Ophthalmometer: R. E. Astigmatism 6.5 D. ax. 28°; L. E. 6. D. ax. 145°. Refraction: V. R. E. + 0.25 s. ⌒ — 5.5 c. ax. 20° = $\frac{20}{60}$ +; L. E. + 0.50 s. ⌒ — 5 c. ax. 173° = $\frac{20}{40}$. The patient was a school-girl. She was permitted to use the eyes for reading two hours daily at divided intervals.

April 29, 1910: V. R. E. + 1.5 s. ⌒ — 6 c. ax. 40° = $\frac{20}{30}$ —; L. E. + 0.75 s. ⌒ — 6.5 c. ax. 107° = $\frac{20}{50}$ +. Patient has been ill. Has used the eyes a great deal.

May 5, 1911.: The refraction is virtually the same as in April, 1910. V., with correction, R. E. = $\frac{20}{30}$; L. E. = $\frac{20}{100}$. The fundi oculorum are normal. The peculiar distortion of the images of the mires is pronounced. Principal axes of the astigmatic error not at right angles.

CASE 8.—Dr. George S. K., aged thirty-four years, came to my office March 25, 1913. Vision was very good until the patient was fourteen years of age, when he was severely ill with typhoid fever. Shortly after his recovery the vision began to be difficult. The change in the cornea apparently began at the age of fifteen years.

Status Præsens.—Patient in robust health. Cornea clear. Fundi normal. Tn. V. R. E. = $\frac{20}{200}$; L. E. = $\frac{10}{200}$. Ophthalmometer: R. E. Astigmatism 5.75 D. ax. 55°; L. E. 4.75 D. ax. 145°. Principal meridians not at right angles in either eye. Peculiar distortion of images of mires pronounced. Refraction: V. R. E. — 1 s. ⌒ — 9 c. ax. 23° = $\frac{20}{60}$ +; L. E. — 1 s. ⌒ — 9 c. ax. 153° = $\frac{20}{100}$. Patient thinks that the process has been virtually stationary for some years.

CASE 9.—Mrs. H. T. D., aged thirty-eight years, came to my office April 4, 1913. Patient in fairly good health. Has never used the eyes to excess for reading or other close work.

Status Præsens.—Ophthalmometer: R. E. Astigmatism 4.5 D. ax. 55°; L. E. 2.87 D. ax. 130°. The principal axes were not at right angles. The peculiar distortion of the images of the mires was present. Refraction: V. R. E. = — 1.5 s. ⌒ — 0.5 c. ax. 85° = $\frac{20}{30}$ +; L. E. — 0.50 s. ⌒ — 2.5 c. ax. 103° = $\frac{20}{40}$ —. Inability to use the eyes with comfort began five years ago.

May 2, 1913: Condition virtually the same. The patient is now using the eyes with comparative comfort.

Treatment of conical cornea may be divided into the non-operative and operative measures; the non-operative into systematic and local. Bradfield[1] thinks that the treatment should begin by correcting errors in the general health. The author is of the opinion that attention to the health is of value in the early stage of the development of keratoconus, and that the patient should be carefully directed regarding the use of the eyes. Locally the instillation of pilocarpin and the application of a light compress bandage at night may be of value, but the treatment must be long continued, extending over six to eight months, at least, to produce any beneficial results. Suitable glasses in the early stage not only improve vision but apparently aid in retarding and limiting the progress of the affection. (See Cases 4 and

[1] *Amer. Jour. Ophth.*, Oct., 1903.

5.) The discussion of special optical measures is purposely omitted.

The operative procedures resorted to have been many. Von Graefe's method was to produce an ulcer at the apex of the cone by removing a small piece of corneal tissue without perforating the cornea. After twenty-four to forty-eight hours the exposed area was treated with the mitigated stick of nitrate of silver, the cauterization being repeated every third day for two or three weeks. Paracentesis through the floor of the cornea was performed and repeated every second day for a week, when healing was permitted to take its course. A compress bandage was employed throughout and subsequently; when the contraction and flattening were complete, a narrow optical iridectomy was performed.

Bader's method consists in removing a small elliptic flap of the cornea at the apex of the cone and bringing the margins together by one or two fine sutures. Some operators place the ellipse vertically, others horizontally. Anterior synechiæ occur in a number of the cases. Optical iridectomy is required.

Mr. Morton's operation[1] is a modification of Bader's operation.

Sir William Bowman's method consisted in removing a disk from the apex of the cornea with a small trephine. Cicatrization of the wound proceeds under a compress bandage, producing the desired flattening.

Multiple puncture of the cone at its apex, using a fine cataract needle, has been employed. The apex of the cone is punctured four to six times at one sitting, repeating it at intervals of two to three weeks. The pupil is kept contracted by the use of eserine and a compress bandage used throughout. "Eventually a network of connective tissue forms which flattens the cone without producing much corneal opacity."

A procedure largely practised is the application of the electrocautery or thermocautery. The cautery is applied in various ways. Sir A. Critchett "first applies the cautery at a black heat to the entire area to be cauterized. Within this area a little more tissue is destroyed by an increased

[1] *Brit. Med. Jour.*, 1880, p. 623.

heat, while the very apex is touched with a cautery at a dull red heat. One sitting is sufficient" (Swanzy). Gayet[1] carried the cauterization to perforation at the apex. Knapp[2] always endeavored to make the perforation as small as possible. He was of the opinion that perforation was essential to success. A modification of the ordinary application of the cautery is advocated by Elschnig.[3] He endeavors to induce vascularization of the cauterized area, believing that it produces a firmer cicatrix. In order to encourage vascularization he connects the central cauterized area by a rather broad cauterized strip to the limbus in a portion of the cornea that will not interfere with the pupillary area. He does not perforate, nor does he think that iridectomy is necessary or desirable. Tattooing of the cicatrix is resorted to in some cases. In order to avoid a dense scar at the center of the cornea Dodd[4] employs the galvanocautery, making a series of cauterized points about 1*mm* apart in the form of a horseshoe, about the apex of the cone, the uncauterized base of the shoe being upward, leaving the pupillary area free. The cauterization can be repeated if necessary. Grossmann[5] advocates cauterizing the cone with superheated air, employing a special apparatus for the purpose.

Angelucci[6] introduced a purse-string suture around the apex of the cone, the suture passing in the substantia propria between Bowman's and Descemet's membranes. The apex of the cornea was cauterized and a portion excised by means of a Graefe knife. The suture was removed in eight days. Vision was improved.

In the study of keratoconus it occurred to the writer that in order to bring about suitable permanent reduction of the cone by operative procedure it was necessary to reduce the tension of the eye as much as possible and to maintain the hypotony for a long period of time; that is, until the healing was complete and the cicatrices firm. To this end it was thought advisable to perform iridectomy, placing the coloboma where

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[1] *Lyon médicale*, xxx., 1879, also Tweedy and Knapp.
[2] Norris and Oliver's *System*, vol. iii., p. 825.
[3] *Wiener klin. Rundsch.*, 1904, 20.
[4] *Med. Press and Circular*, February, 1903.
[5] *Brit. Med Jour.*, Aug. 26, 1905.
[6] *Bull. de la Soc. Belge d'Oph.*, No. 29, p. 56, 1910.

it would ultimately be of greatest aid to vision because of its well-known tendency to reduce intraocular tension, and, at the end of one or two weeks, to apply the chosen procedure to the apex of the cornea, following this by the use of pilocarpin and a compress bandage. In the five operated cases reported this plan of procedure was followed. An iridectomy back of clear cornea, upward, upward and inward, or upward and outward, was performed. Ten days later the apex of the cone was cauterized, the cauterized area being oval, its long axis horizontal, and seldom extending above the horizontal meridian of the cornea. Cauterization was performed with a platinum point heated to a red heat in the flame of a spirit-lamp. The eschar was carried as deep as possible at the apex without perforating the cornea. The subsequent treatment consisted in the use of borated vaselin, pilocarpin, and a compress bandage, the bandage being applied continuously for three weeks and at night for two months.

The following are the reports of cases treated as described above:

CASE I.—Mr. J. S. B., aged twenty-seven years, consulted me at my office May 26, 1895. In 1890 patient was an excellent shot. Was a stenographer in government employ at Washington, worked arduously during the day and attended night school, used the eyes day and night. First noticed failure of vision in the spring of 1891. Up to the spring of 1893 patient had consulted four quite well-known ophthalmologists, all of whom failed to make a diagnosis. Had many changes of glasses. Was treated by internal medication, electricity locally, etc. Consulted the late Dr. Bell, of Washington, in the spring of 1893, who made a diagnosis of keratoconus. Saw the late Dr. H. Knapp early in the year 1895, who gave glasses, but advised against operative procedure.

When examined by me, the ophthalmometer gave the peculiar images of the mires always observed in keratoconus. R. E. = Astigmatism 7.5 D. ax. 10°; L. E. = Astigmatism 10 D. ax. 160°. The left cornea pulsated, the difference in the refraction at the apex of the cone being 1.25 D. between diastole and systole. V., without correction, R. E. = $\frac{8}{200}$; L. E. = $\frac{1}{400}$. With correction, R. E. = + 1. s $\bigcirc$ — 7. c. ax. 85° = $\frac{20}{40}$ —; L. E., with best glass possible, = $\frac{3}{200}$. With correction and stenopaic slit V. R. E. = $\frac{20}{30}$ —; L. E = $\frac{20}{200}$.

In June, 1899, I performed iridectomy on the left eye and later cauterized the apex of the cone. On November 6, 1900, V. R. E., = + 1.5 s. ⌒ — 7 c. ax. 85° — $\frac{20}{40}$ +; L. E. = — 2 s. ⌒ — 2. c. ax. 140° — $\frac{20}{200}$ +. On November 19, 1908, (when last seen) V. R. E. = + 2.5 s. ⌒ — 6 c. ax. 86° = $\frac{20}{30}$ —; L. E. = — 2 s. ⌒ — 2 c. ax. 140° = $\frac{20}{200}$.

It is interesting to note the change in the corneæ as indicated by the Javal measurements. While the June reading gave 7.5 D. ax 10° in the right eye at the first measurement, it was found that the best visual results were obtained with the axis of the cylinder at 15°. In September, 1896, the Javal gave astigmatism 6 D. ax. 90°; November 19, 1908, 6 D. axis 87°. The left eye by Javal gave astigmatism 10 D. ax. 10° before operation, 0.5 D. ax. 20° shortly after operation, and, at the last measurement, November 19, 1908, 1.5 D. ax. 105°.

In this case the condition of the right eye was virtually stationary when the patient was first seen by me. The refraction has changed from hyperopia 1 D. in the meridian of least curvature to hyperopia 2.5 D. Since the operation the astigmatism of the left eye has changed from 0.5 D. ax. 20° to 1.5 D. ax. 105°. Both eyes have been stationary during the last two or three years.

CASE 2.—Miss M. F. C., age fifty-four years, came to my office December 31, 1911. Has never suffered any severe illness. Is now in good health. Began to have trouble with vision at about the age of nineteen years. Difficulty increased to the age of thirty-five years since which time there has been but little change. Ten years ago was operated on the left eye by Pagenstecher at Wiesbaden, who did an iridectomy to the temporal side, cauterized the apex of the cone, and tattooed the scar.

Status Præsens.—Right eye: Pronounced conical cornea. Three small white spots at the apex of the cone, also some haziness of the cornea involving the cone and extending almost to the periphery below. V = $\frac{3}{200}$; improved to $\frac{6}{200}$ with a midriatic; not materially increased by the use of glasses or pin-hole diaphragm. Javal unsatisfactory. Fundus normal. Tn. No pulsation of apex of cone.

Left eye: Cornea conical. Tattooed at apex. Coloboma outward. Cornea hazy except in upper third V. = $\frac{6}{200}$ improved to — $\frac{8}{200}$ with glasses. Fundus normal. Tn. Reads ordinary type with difficulty by holding the page close to the face.

In the belief that, by reducing the acuity of curvature of the cornea, and by placing the pupil opposite the clearest portion of the cornea, better vision could be obtained, I

advised an iridectomy and a subsequent cauterizing of the apex of the cone.

October 10, 1912, iridectomy right eye upward. Operation smooth. Healing uneventful. December 20, 1912, V. = $\frac{8}{200}$. January 2, 1913, cauterized the apex of the cone. Dressings daily, introducing borated vaselin (3 per cent.) into the right eye and afterward applying a light compress bandage. This was continued three weeks. February 12, 1913, V. R. E., with—6 s. = $\frac{20}{100}$. Curvature of cornea much reduced. Tn. —. February 18, 1913, epithelium over area of cauterization vesicular. Condition similar to recurrent erosion keratitis. March 4, 1913, as the corneal epithelium at the apex of right eye did not become firmly adherent, patient was referred to the Infirmary, the cauterized area, thoroughly curetted, borated vaseline introduced, and the eye bandaged. The epithelium readily re-formed, but ten days later again became detached. Hot bathing, *t. i. d.* one hour at a time, was advised. March 27, 1913, eye smooth. Curvature of cornea greatly reduced in acuity. April 9, 1913, V. R. E., with glasses = $\frac{20}{200}$ +. Reads Jaeger 5 fairly readily. The vision appears to be gradually improving.

Case 3.—Mrs. P. L. B., aged thirty-seven years, came to my office October 16, 1906. Patient of medium height, apparently in good health. Vision began to fail at the age of twenty-three years, and has failed rapidly during the last three years. Does not use the eyes excessively for close work. Diagnosis: Conical cornea. With the exception of the corneæ the eyes are normal. Tn.

Status Præsens.—Right eye, ophthalmometer 1.5 ax. 5°. Curvature of cornea not regular in any meridian. The approximately principal meridians not at right angles. V. with —1 s. ⊃ + 5 c. ax. 5° = $\frac{20}{60}$ +. Tn. No pulsation.

Left eye. Ophthalmometer 3 D. ax. 90°. Curvature of cornea not regular in any meridian. Principal meridians not at right angles. V. with + 4.5 s. ⊃ — 9.5 c. ax. 105° = $\frac{20}{100}$ +. Cone pulsates, the movement of the apex being about $\frac{1}{10}$*mm.* Two very small grayish spots at the apex of the cone.

October 10, 1910, V. R. E. = — 2 s. ⊃ + 6 c. ax. 177° = $\frac{20}{40}$ +; L. E., with correction as above = $\frac{15}{200}$.

January 14, 1913, V. R. E. = — 1.5 s. + ⊃ 6 c. ax. 177° = $\frac{20}{40}$. Although the astigmatism during the six and one-third years of observation had slightly increased in this eye, the vision with correction had slightly increased and the eye appears to be now at a standstill so far as the keratoconus is concerned. Left eye: V., with correction, = $\frac{2}{200}$ —.

During the same period of observation the vision had fallen from $\frac{20}{200}$ + to counting fingers at two feet. The apex of the cone was below the horizontal meridian of the cornea. The opacities at the apex had coalesced and enlarged. Operative procedure was advised for the left eye, and an iridectomy upward was performed January 14, 1913. Ten days later the apex of the cone was cauterized. April 22, 1913, V. = — 2 s. ⌒ — 3 c. ax. 60° = $\frac{15}{200}$. Patient complains of some photophobia. Eye quiet.

CASE 4.—Miss Margaret V., aged twenty-five years, referred to me by Dr. Dobson, of Poughkeepsie, December 6, 1912. Height about 5 feet 11 inches. Attained present stature at about the age of sixteen years. Grew rapidly. Has lived in the country, much out-of-doors. No history of excessive close use of eyes. Is now strong and robust. Noticed beginning of impairment of vision at age of sixteen years. Vision has grown decidedly worse during the last three years.

Status Præsens.—Right eye: Pronounced keratoconus apex slightly below the center of the cornea, transparent. Javal 14 D. of astigmatism, axis approximately 180°. Eye normal except the corneal condition. Tn. V. = $\frac{3}{200}$, with pin-hole diaphragm = $\frac{30}{200}$ —, with — 9 ax. 180° = $\frac{20}{200}$ —.

Left eye. Pronounced keratoconus. Apex of cone below the horizontal meridian. Small opacity at apex. Slight haziness of cornea about apex and slightly below. Pulsation causing bulging of cornea about $\frac{1}{6}$ *mm* at each systole. Eye normal except for the corneal condition. V. with pinhole = $\frac{18}{200}$, not improved with glasses. Tn. —.

On January 9, 1913, the patient was admitted to the New York Eye and Ear Infirmary, and an iridectomy was performed on the left eye. Healing uneventful. January 21st, apex of cone cauterized. Eye kept under a light compress bandage three weeks and bandaged at night three weeks longer. Recovery uneventful.

February 13th, iridectomy upward performed on the right eye. Healing uneventful. Apex of cone cauterized February 22d. The eye was kept under a light compress bandage three weeks and bandaged at night three weeks longer. Recovery uneventful.

March 25, 1913, tension of both eyes slightly minus. Condition excellent. V. R. E. = + 3 s. ⌒ — 10 c. ax. 13° = $\frac{20}{100}$; L. E. = + 1 s. ⌒ — 10 c. ax. 170° = $\frac{20}{100}$ +. Reads Jaeger 2 with facility.

Advised the use of pilocarpin muriate 0.75 per cent., once daily for the purpose of keeping the tension low until the cicatrix becomes firm. Compress bandage at night.

CASE 5.—Victor B., aged thirty-seven years, came to my clinic at the New York Eye and Ear Infirmary on March 25, 1913. Has always been near-sighted. Vision began to fail eight years ago. Has always read much at night as well as in the daytime. Has always been well. In August, 1906, the apex of the conical cornea of the right eye was cauterized by an ophthalmic surgeon.

Status Præsens.—Pronounced keratoconus in both eyes. Vision $\frac{5}{200}$ each, improved but little with glasses. Apices of cones slightly below the horizontal meridian of the cornea. Very slight pulsation. There was a long, narrow, irregular opacity at the apex of the cone of the right eye, not very dense, probably largely due to the cauterization, a minute opacity at the apex of the cone of the left eye. March 27th, iridectomy upward, left eye. April 6th, cauterized the apex of the cornea, left eye. May 3d, V. L. E., without correction $= -\frac{18}{200}$; with correction $= \frac{20}{100} +$.

An analysis of the foregoing cases goes to show that when the vision in keratoconus has fallen to $\frac{8}{200}$ or less, it may be improved very much by the operative procedure described. In Case 1, which has been under observation fourteen years since the operation, the cornea has remained unchanged. That complications may arise is evident from Case 2. The recurrent detachment of the epithelium from the cauterized area was apparently due to reduced vitality in an individual of advanced years. The inference from the observation of the behavior of the corneal epithelium in the other cases is that, in young individuals, the complication will probably not occur because of a more vigorous state of vitality of the corneal tissue.

Photophobia is complained of by some patients, but this annoying symptom appears to be very transient.

In regard to other operative procedures, it occurs to the writer that large central perforations, either by trephining or by cauterizing, may lead to fistulæ occasioning no little annoyance in their closure. Meller cautions against using a trephine more than 1*mm* in diameter.

THE EXPERIMENTAL PRODUCTION OF SCLERO-KERATITIS AND CHRONIC INTRAOCULAR TUBERCULOSIS.[1]

By F. H. VERHOEFF, A.M., M.D., BOSTON, MASS.

FROM THE PATHOLOGIC LABORATORY OF THE MASSACHUSETTS CHARITABLE EYE AND EAR INFIRMARY.

(With eight figures on Text-Plate IX.)

THREE years ago I brought forward the theory that in tuberculous scleritis and keratitis the infection reached the sclera and cornea by way of the aqueous humor and ligamentum pectinatum.[2] The bacilli, it was assumed, passed into the aqueous humor either directly from the capillaries of the ciliary body or from small metastatic foci situated just beneath the pars ciliaris retinæ. The theory was deduced chiefly from the histologic findings in an eye with typical tuberculous sclero-keratitis in which both old and recent lesions were present. Since then I have had opportunity to examine histologically several additional cases that have given confirmation to the theory, and still more recently I have succeeded in obtaining experimental evidence which not only strongly supports this theory, but which goes to prove that chronic intraocular tuberculosis has, in general, a similar origin. It is this experimental evidence that forms the basis of the present communication.

In 1907 Stock[3] published the results of an investigation in

[1] Read before the American Ophthalmological Society, Washington, May 7, 1913.

[2] "The histologic findings in a case of tuberculous cyclitis, and a theory as to the origin of tuberculous scleritis and keratitis." *Trans. Amer. Ophth. Soc.*, 1910.

[3] "Tuberkulose als Aetiologie der chronischen Entzündungen des Auges

which he had injected living tubercle bacilli into the ear-veins of rabbits. He found almost constantly focal lesions throughout the uvea, the most notable feature of which was their tendency to heal without destroying the eye. These results have led Stock and others to attach great importance to tuberculosis as a cause of chronic uveitis in man. I have come to believe, however, that Stock's experiments were conducted under conditions so different from those obtaining in human cases of chronic ocular tuberculosis that they are of little significance in regard to the latter. In his experiments large numbers of virulent bacilli were suddenly introduced into the blood of animals presumably free from tuberculosis. In human ocular tuberculosis of the chronic type, on the other hand, the patient has previously been affected with tuberculosis, usually glandular in character, and has acquired a relative immunity which must necessarily influence the eye lesions. The importance of this difference is shown by clinical experience, for according to Stock's results the most common type of ocular tuberculosis should be uveitis, while sclero-keratitis should be exceptional, whereas in reality the latter is common while tuberculous iritis and choroiditis are relatively extremely rare. Moreover, the ciliary body was seldom affected in Stock's experiments, and when it was the lesions did not involve the inner surface of the ciliary processes, thus differing greatly from the lesions of chronic tuberculous cyclitis in man.

In only two of his animals did Stock find active scleritis. In one of these there was an extensive involvement of the sclera in the equatorial region clearly due to direct extension from the choroid. Clinically the appearance produced was not unlike that of brawny scleritis in man, and Stock, therefore, inferred that the latter condition may result from tuberculosis. In his discussion Stock does not clearly distinguish between brawny scleritis and anterior nodular scleritis. In a recent paper[1] I have shown that these two conditions, both clinically and histologically, are entirely different; that, moreover, brawny scleritis begins in the sclera and only

und seiner Adnexe, besonders der chronischen Uveitis." *Graefe's Arch. f. Ophthalmologie.*, 1907, lxvi., p. 1.

[1] "Brawny scleritis." *The Opthalmoscope*, Jan., 1913, p. 1.

ILLUSTRATING DR. VERHOEFF'S ARTICLE ON "THE EXPERIMENTAL PRODUCTION OF SCLERO-KERATITIS AND CHRONIC INTRAOCULAR TUBERCULOSIS."

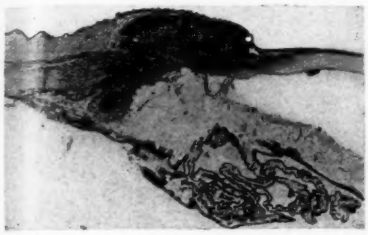


FIG. 1.

FIG. 2.

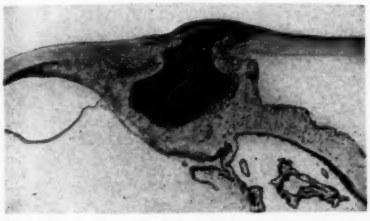


FIG. 3.

FIG. 4.

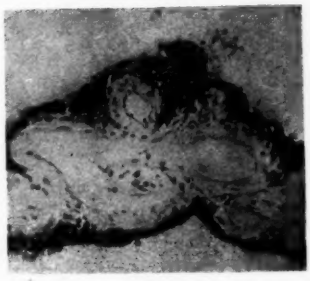


FIG. 5.

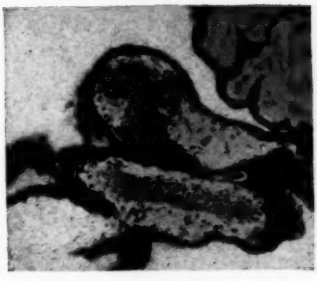


FIG. 6.

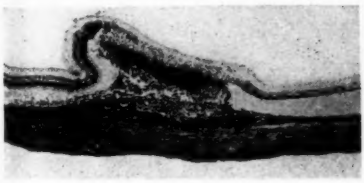


FIG. 7.

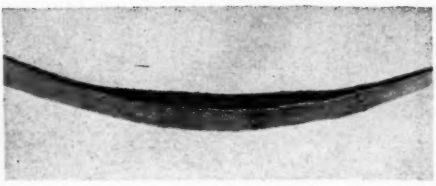


FIG. 8.

FIG. 1. (Experiment 2.) Sclero-keratitis due to dead tubercle bacilli introduced into vitreous of rabbit. Note also minute tubercle on membrane of Descemet.

FIG. 2. (Experiment 5.) Sclero-keratitis due to dead tubercle bacilli introduced into anterior chamber of immunized rabbit. Note also intercalary staphyloma and small tubercle of iris.

FIG. 3. (Experiment 2.) Caseating tubercle involving ciliary body and sclera, due to dead tubercle bacilli introduced into vitreous of rabbit.

FIG. 4. (Experiment 3.) Caseating episcleral tubercle and large tubercle of ciliary body due to dead bacilli introduced into anterior chamber.

FIG. 5. (Experiment 5.) Small tubercle making its way through epithelium of ciliary body from without.

FIG. 6. (Experiment 5.) Small tubercle entirely within ciliary process. This evidently originated outside the process as indicated in Fig. 5.

FIG. 7. (Experiment 2.) Caseating tubercle of retina due to clumps of dead tubercle bacilli which have passively entered the retina from the vitreous.

FIG. 8. (Experiment 3.) Tubercle of chorioid due to dead tubercle bacilli introduced into anterior chamber which have passed along the sub-chorioidal space.

secondarily affects the uvea, and that in all probability it is due to syphilis. In the other animal Stock obtained a large caseating focus involving the corneo-scleral junction and producing the clinical picture of sclerosing keratitis, which he assumed originally had extended by continuity from the anterior part of the choroid.

As I have previously pointed out, histologic examinations in human cases show that tuberculous scleritis does not arise by continuity from the uvea, as assumed by Stock. The possibility of direct metastases from the blood can also be excluded by the facts that metastases to the sclera rarely if ever occur in cases of malignant tumors, pyemia, miliary and other active forms of tuberculosis. Moreover, in case of the choroid such metastases are relatively common, so that if nodular scleritis was due to blood metastases, chronic tuberculous choroiditis should be far more frequent than tuberculous scleritis, whereas the reverse is true. This argument is strengthened by Stock's large series of experiments just referred to, in which the choroid almost invariably showed metastatic foci, while the sclera was affected in no more than three animals and here apparently not by direct blood metastases. Extension from the uvea and direct metastasis from the blood thus being excluded, the only remaining possibility would seem to be that anterior nodular scleritis in man is due to metastases through the filtration angle from the aqueous humor, and this origin I have shown to be clearly indicated by the histologic findings in enucleated eyes.

In endeavoring to test experimentally this theory, it obviously would not be practical to attempt to reproduce all the conditions occurring in human cases. For, granting the possibility of producing a systemic chronic tuberculosis similar to that in man, the percentage of animals that could be expected to develop scleritis would be far too small. On the other hand, the attempt to produce tuberculous scleritis by introducing live virulent bacilli into the vitreous chamber would also be impractical, because an active intraocular tuberculosis would ensue before scleritis could develop. In human cases it is clear that, since the lesions are of a mild type and ultimately always heal, the bacilli must be relatively inactive. It occurred to me, therefore, that for experimental

purposes dead bacilli might serve, and as will be seen, this has proved to be the case.

In the following experiments bacilli from a three-weeks'-old culture of virulent human tubercle bacilli on glycerin agar were used. They were killed by exposure to ultra-violet light, although the same results no doubt could be obtained with bacilli killed by heat. Two loopfuls of bacilli were stirred into *2cc.* of distilled water, and then exposed for ten minutes to the light of a Cooper-Hewit quartz mercury vapor lamp (220 volts, 3.5 amperes) without the globe, at a distance of *20cm.* This suspension was drawn up through a fine needle into a hypodermic syringe, and a few drops then injected through the sclera or into the anterior chamber as desired. Thus no attempt was made accurately to adjust the dosage. In three eyes no lesions resulted, due possibly to large clumps of bacilli lodging in the needle and preventing a sufficient number of bacilli entering the eyes.

EXPERIMENT I.—Injection of dead tubercle bacilli into vitreous humor of left eye of rabbit.

After seven weeks a minute spot is seen on the surface of the iris. There are no scleral nodules, and the eye is free from congestion. Enucleation.

Macroscopic Examination.—In addition to the spot on the iris, an elevated spot beneath the retina corresponding to the puncture wound, and a tubercle in the fundus, *1mm* in diameter, are seen.

Microscopic Examination.—The iris shows a few small tubercles on its surface and within the stroma, besides the large one seen macroscopically. The relative scarcity of lesions in this eye is evidently due to injection of fewer bacilli than in subsequent experiments. Numerous tubercles are found in the ligamentum pectinatum. These are too small to involve the sclera to any extent, but some of them extend into the subchoroidal space. They occur above as well as below, but are largest below. They, as well as the iris tubercles, consist of endothelial cells with occasional giant-cells, but show no caseation. They contain from one bacillus in three fields to three bacilli in one field. The surface of the ciliary body is almost free from tubercles, but a few minute tubercles are seen on the orbiculus ciliaris, one of which has destroyed the epithelium. One small tubercle is found free in the anterior part of the vitreous, made up of endothelial cells free from necrosis. Two others, each about *.2mm* in size, are seen in the pos-

terior part of the vitreous near the retina. The latter are almost completely necrotic, and surrounded apparently by young connective-tissue cells.

At the site of the puncture wound there is a tubercle without caseation which involves chiefly the choroid. The tubercle of the retina in the fundus involves mainly the outer retinal layers, destroying the pigment epithelium and the inner layers of the choroid, and leaving the inner layers of the retina intact. It is free from caseation. The surrounding choroid is infiltrated with plasma and lymphoid cells. The tubercle contains only a few bacilli. At the equator below there are two small tubercles on the surface of the retina, and the latter in this region is giving off a considerable exudate of pus cells.

In juxtaposition to the optic disk the choroid shows a large tubercle, over which the pigment epithelium and retina are intact. This was probably due to metastasis from the large retinal tubercle a short distance away from it. A few minute choroidal tubercles are also seen elsewhere in the fundus.

EXPERIMENT II.—Injection of dead tubercle bacilli into vitreous humor of rabbit's eye (Figures 1, 3, and 7).

Eleven weeks later the eye is still perfectly free from congestion, but the iris shows numerous small white spots, irregular in shape, the largest being .75*mm* in diameter. The cornea is clear. At the limbus on the outer side there are three elevated nodules, and on the inner side there are also three. The largest is 2.5*mm* in diameter, and extends .25*mm* into the cornea. The others are each about .75*mm* in diameter, and situated .25*mm* from clear cornea. Directly below there is a single nodule 2.5*mm* in diameter, which is more elevated than any of the others. It has an opaque center with translucent periphery. Enucleation.

Macroscopic Examination.—The inner surface of the ciliary body shows 14 irregular shaped white spots, not elevated, the largest 2*mm* in diameter, situated just behind the ciliary processes. The retina and choroid are *in situ*, and show in the lower quadrant 14 elevated round spots with opaque centers, and a single similar spot in the upper outer quadrant. The vitreous humor is clear.

Microscopic Examination.—Only a few small tubercles happen to be encountered in the iris. These are usually near the anterior surface at the pupillary margin or near the root. None is seen on the posterior surface. The white spots seen on the inner surface of the ciliary body macroscopically are found to be tubercles in the filtration angle showing through. The smallest tubercles are centered in

the ligamentum pectinatum; some of the largest ones sometimes involve chiefly the sclera and cornea, others also the ciliary body. Most of them show caseous centers containing about two bacilli in a field. No clumps of bacilli are seen here. Extending out from the large tubercle below, the cornea is infiltrated and vascularized for a considerable distance, but only superficially. On the posterior surface of the cornea here and there occur small nodules of endothelial cells.

Several small tubercles are seen in the vitreous humor in the vicinity of the ora serrata. These are made up of branching cells and are surrounded by capsules of young connective tissue. Some are slightly infiltrated with pus cells, but they show no caseation.

The elevated spots in the fundus are found to be tubercles situated between the choroid and retina and involving both of these structures (Figure 7). The rods and cones, and to a less extent the nuclear layers, are replaced by a caseous mass containing necrotic pigment cells and pigment granules. Behind this the pigment epithelium is destroyed, and from the inner layers of the choroid an exudation of endothelial cells is taking place. Deeper down and at the periphery of the tubercle the choroid is richly infiltrated with plasma cells. Within the caseous mass fairly numerous tubercle bacilli occur, usually singly, rarely in small groups. Tubercle bacilli are also found free in the intact retina over the tubercle.

EXPERIMENT III.—Injection of dead tubercle bacilli into anterior chamber of rabbit's eye (Figures 4 and 8).

After twelve weeks the eye shows slight pericorneal injection and the pupil is somewhat contracted. There are numerous tubercles on the iris, and two scleral tubercles near the limbus below, 5*mm* apart. Each of the latter is about 1*mm* in diameter externally. Enucleation.

Macroscopic Examination.—In the choroid a single white spot, not appreciably elevated, is found 1*mm* below the medullated streak and 8*mm* from the disk. There are no tubercles of the retina.

Microscopic Examination.—A large tubercle almost completely caseous is found replacing the ciliary body and root of iris below. It contains numerous bacilli, some of them in large clumps. In front of this, but not in direct continuity with it, there is a smaller tubercle in the episcleral tissue, corresponding to one of the tubercles seen before enucleation (Figure 4). This also has a caseous center and contains numerous discrete bacilli but no clumps. The cornea in this region shows a marked infiltration and is richly vascu-

larized. The infiltration reaches almost to the pupillary area. There are no foci of epithelioid cells in the cornea, the reaction evidently being due to toxins diffused from the tubercle in the ciliary body. On the posterior surface of the cornea there are nodules of endothelial cells. The filtration angle shows smaller tubercles elsewhere, but none above.

The iris shows numerous minute tubercles, most of them on its surface but some also within its stroma.

A few minute tubercles are found below, on and within the ciliary processes, as in experiment V. These are no doubt due to bacilli which were carried into the aqueous humor from the large tubercle of the ciliary body and deposited on the ciliary processes.

The choroid below shows a few discrete foci of endothelial cells leading away from the filtration angle. The white spot in the choroid seen macroscopically is found to be a flat tubercle *2mm* in diameter (Figure 8). It does not involve the retina, and consists of epithelioid cells in the deepest layers of the choroid with lymphoid cell infiltration of the chorio-capillaris. This tubercle contains very few bacilli, no more than one being found in any section examined.

EXPERIMENT IV.—Injection of dead tubercle bacilli into vitreous humor of left eye of rabbit which had healed tuberculosis of right eye. The right eye had been inoculated with the bacillus of lupus two years previously and was in a state of phthisis bulbi free from inflammation.

Within one week the left eye showed a severe inflammatory reaction, with iritis. This rapidly subsided. Enucleation at end of five weeks.

Microscopic Examination.—The anterior part of the vitreous humor is solidly infiltrated with necrotic pus cells which show a nodular arrangement around clumps of tubercle bacilli. Posteriorly the vitreous is infiltrated chiefly with serum. The retina is separated almost everywhere, and is giving rise to a marked exudation of pus cells but no endothelial cells. From the ciliary body, granulation tissue is making its way into the infiltrated vitreous. Upon and beneath the surfaces of the ciliary processes, minute foci of endothelial cells are sometimes seen, similar to those in Experiment V. The pupil is occluded by membrane. The iris shows a few tubercles on its surface and within the stroma. The filtration angle shows numerous tubercles which are usually closed off by adhesions of the root of the iris to the cornea. These are largest below. The cornea for a considerable distance from the limbus both above

and below is vascularized and infiltrated in its superficial layers, but it contains no tuberculous foci.

The choroid shows numerous small nodular infiltrations with plasma cells containing occasionally central foci of endothelial cells, and at the equator a large tubercle, 1.5*mm* in diameter, to which the retina is adherent. This tubercle is made up of endothelial cells surrounding a central area of necrotic pus cells. The latter does not represent actual caseation; in fact, caseation is absent from all the lesions in this eye.

In the main mass of exudate within the vitreous, bacilli are found only when in clumps, and these stain so feebly that they are visible simply because they are massed together. No bacilli are found in any of the other lesions except in the large tubercle of the choroid, in which a few poorly stained bacilli can be seen.

EXPERIMENT V.—Injection of dead tubercle bacilli into anterior chamber of left eye of rabbit which had healing tuberculosis of right eye. The right eye had been inoculated with the bacillus of lupus five months previously (Figures 2, 5, and 6).

Two days later the left eye was congested, there was some exudate in the anterior chamber, and the corneal puncture wound was infiltrated. This active reaction began to subside after one week. After one month there was a vascularized tubercle at the site of the corneal puncture and several tubercles at the pupillary margin of the iris.

After two months there was very little congestion, the corneal tubercle was smaller, and there was a large nodule at the limbus below.

After four months the corneal tubercle is apparently healed, the pupil is dilated, leaving numerous tubercles at the end of synechiæ on the lens surface. The eye is almost free from congestion. The nodule below is 5*mm* in diameter, and involves the sclera and cornea. Enucleation of left eye.

Microscopic Examination.—There are numerous tubercles of the iris, most of them small, on the surface and within the stroma. About them there is considerable infiltration, with plasma cells, but no pus cells. Foci of endothelial cells are found in the filtration angle here and there, but there is scleritis only below. Here there is a large conglomerate tubercle involving the sclera and cornea, but affecting the ciliary body very little. The sclera has been weakened, so that there is a small intercalary staphyloma, and it shows more involvement superficially than deeply. The cornea also is mainly involved in its outer layers. There is a deep

discrete focus, however, which originally had evidently extended outward from the ligamentum pectinatum, that has undermined and curled up Descemet's membrane. There is marked plasma cell infiltration around these foci but no purulent infiltration except in the centers of one or two. A few endothelial nodules are seen on the posterior surface of the cornea.

On and within the ciliary processes a number of minute foci of endothelial cells are found below. These are situated sometimes on the tips of the processes, sometimes on their sides, but none is seen in the sulci between them. Some of them are entirely within the stroma and covered with intact epithelial layers (Fig. 6), others are entirely on the surface, and still others partly within and partly without the surface, the epithelium here being broken through (Fig. 5).

The choroid shows a number of flattened foci, some of them occurring even posterior to the equator. Each consists of a few central endothelial cells surrounded by a dense zone of plasma cells.

The tubercles in this eye present a somewhat different picture from those of shorter duration in the previous experiments. Here, instead of the endothelial cells being round and discrete, with single nuclei, most of the cells are irregular in shape, many of them multinucleated, and are united with each other by processes, thus forming a syncytium. In the interstices Van Gieson's stain shows connective tissue making its way from the periphery, accompanied by connective-tissue cells. None of the lesions shows caseation. Tubercle bacilli are seldom found, none being seen in the small foci, such as those in the iris, and after a long search only one or two poorly stained discrete bacilli in the scleral tubercle. A few clumps of bacilli, however, are found in the latter.

The above experiments show that, when dead tubercle bacilli in sufficient numbers are introduced into the vitreous or anterior chamber of a rabbit, many are carried to the filtration angle, where, after about three months, they produce nodules in the corneo-sclera closely simulating those of sclerokeratitis in man. At the same time lesions are produced in the iris and choroid, and, in case of injection into the vitreous humor, also in the retina. Usually the ciliary body is involved along with the sclera, and this constitutes the chief difference between the experimental scleritis and the natural disease. This difference is probably due to the facts that the

size of a lesion produced by dead bacilli is dependent upon the number of bacilli present at its inception, whereas in case of the natural disease, presumably due to living bacilli, the size of the lesion is dependent upon the suitability of the soil for the proliferation of the bacilli. Thus, in the latter case, the living bacilli, finding no doubt the cornea and sclera owing to their poor blood supply especially favorable for their growth, involve these structures almost exclusively. In spite of these facts, however, in several instances lesions of sclero-keratitis occurred in the experiments with practically no involvement of the ciliary body. No discrete foci occurred in the cornea away from the limbus, evidently because dead bacilli could not be carried into the cornea in sufficient numbers.

In both size and number the lesions in the filtration angle and sclera were much greater than any other lesions in the eyes, showing that more bacilli lodged here than elsewhere. They did not occur exclusively below, as might have been expected, but where the bacilli were introduced into the vitreous humor were more numerous laterally, and some small ones occurred directly above. This fact tends to nullify the objection to the theory previously pointed out by me, namely, that the nodules in human cases are more frequent above than below. In the case of the natural disease the bacilli, of course, could not occur in such large clumps, and hence would have less tendency to settle to the bottom of the anterior chamber. It is not necessary to assume that the bacilli were carried from the vitreous humor by the actual flow of fluid, since their transition may have been due to the frequent movements of the eyes In the experiments in which the bacilli were introduced directly into the anterior chamber, the scleral nodules always developed below, due evidently to the fact that the clumps of bacilli did not have time to disintegrate to any great extent.

The tubercles of the iris in these experiments occurred most commonly near the pupillary margin. They were most often on or just beneath the anterior surface, though occasionally one was seen deeply seated in contact with the pigment layers. Tubercles similar to those on the anterior surface of the iris were also found on the posterior surface of the cornea.

The tubercles of the retina, seen in Experiments I, II, and IV

are probably of no great significance in regard to human ocular tuberculosis, the conditions under which they occurred being too far abnormal. They were undoubtedly due to bacilli which penetrated the retina from the vitreous humor. They are of interest in showing how slightly the retina reacts to tubercle bacilli, single bacilli and even clumps having passed through the retina to the pigment epithelium before causing lesions, which, moreover, destroyed the outer retinal layers only. The cells forming the tubercle were derived chiefly from the choroid. In the natural disease such foci would not often occur, because the bacilli would be carried to the anterior chamber rather than into the relatively solid vitreous. In two cases of tuberculous cyclitis, however, I have seen tubercles of the retina, one of them of considerable size, which were probably due to bacilli deposited from the vitreous. Of still less practical significance were the small tubercles found on the surface of the retina in these experiments, and others occurring isolated in the vitreous humor.

Of greater import were the tubercles of the choroid which did not involve the retina. These occurred chiefly in the anterior part of the choroid but occasionally also in the fundus (Fig. 8). In the experiments in which bacilli were injected into the vitreous humor and retinal tubercles resulted, it is conceivable that the choroidal tubercles were due to metastases from them in the post-choroidal space. This explanation is not possible, however, where the injections were made into the anterior chamber, for retinal tubercles were absent. Here it is certain, excluding the remote possibility of blood metastasis, that the choroidal foci were due to bacilli carried from the filtration angle in the post-choroidal space. These experiments strongly indicate, therefore, that the choroidal lesions sometimes seen in cases of human scleritis are produced in the same way and are not blood metastases. They also suggest the possibility, at least, that this is true also for the majority of the relatively benign forms of tuberculous choroiditis.

The fact that dead tubercle bacilli can produce tubercles is, of course, well known, and need not be discussed here at length. The smaller experimental lesions show essentially the same histologic character as I have found in the lesions of human cases of tuberculous scleritis and keratitis. Both

consist at first of discrete endothelial cells which later unite by processes forming a syncytium into the meshwork of which connective tissue makes its way. In the human lesions caseation almost never occurs, and in the experimental lesions it occurs only in the largest tubercles in which bacilli are present in excessive numbers. Langhan's giant-cells are found with about equal frequency in both. In the smaller experimental lesions remarkably few bacilli are often found, in single sections of a lesion sometimes none being seen. This fact makes it less difficult to understand why bacilli are most often impossible to find in human lesions.

These experiments, of course, do not throw any direct light on the question as to just how the bacilli reach the aqueous, as we may now assume they do, in human cases of chronic ocular tuberculosis. In the case of scleritis already referred to, I found focal lesions on and just beneath the pars ciliaris retinæ, and assumed that these were the sources of the bacilli causing the active scleritis. It was clear, however, that the older corneal and scleral lesions in this case could not have been due to them, and this, with the fact that in certain other cases ciliary lesions were absent, led me to believe that the bacilli might pass into the aqueous from the vessels of the ciliary body without producing any lesions in their transit. The results of the present experiments now suggest this to be the rule instead of the exception, and that, when focal lesions on the ciliary body occur such as just noted, they do not represent direct metastases from the blood but are due to bacilli, or infected cells which have been deposited from the aqueous. For, in some of these experiments, minute tubercles were found both upon and even entirely beneath the epithelium of the ciliary body processes. Those beneath the surface were clearly due to groups of endothelial cells which had broken through the epithelium, the latter then re-forming over them, for all stages in this process could be made out. Had these small foci contained living tubercle bacilli, they would have grown to larger size. These observations thus make it seem more than probable that the most common types of tuberculous, cyclitis and iritis, even when not associated with scleritis or keratitis, are also due to bacilli or infected cells deposited from the aqueous humor.

The two experiments in which dead tubercle bacilli were injected into eyes of rabbits previously immunized to tuberculosis, gave some interesting results which may further explain the difficulty of demonstrating bacilli in human cases of chronic ocular tuberculosis. The immunization was accomplished by infecting one eye of each rabbit with the living bacilli of lupus. When dead bacilli were injected into the vitreous of the normal eye they quickly caused it to become infiltrated with pus, a reaction no doubt analogous to that of the v. Pirquet test. The purulent exudation soon ceased and the pus became necrotic, but the bacilli evidently became free from it and were carried to the anterior chamber, since endothelial tubercles were produced on the iris and filtration angle as in the case of non-immune animals. When the bacilli were injected into the anterior chamber directly, they likewise gave rise to a prompt and severe pyogenic reaction which quickly subsided, and later produced tubercles as usual. But the fact of especial significance in these two experiments was that most of the bacilli lost their acid-fast properties, due, probably, to the action of the animals' immune serum. Thus, except in the clumps where they were visible on account of being massed together, almost no bacilli could be found, the few seen after prolonged search staining poorly. In spite of this, lesions were produced equal in size to those of the other experiments in which the bacilli were still demonstrable. It must be noted, however, that even in the latter a small proportion of the bacilli stained feebly. It is conceivable also that in all the experiments lesions were due in part to non-acid-fast bacilli introduced from the original cultures.

A fact now well established is that the aqueous humor is relatively free from immune substances, except when, as a result of paracentesis or an active intraocular inflammation, it becomes mixed with serum. This may be of considerable importance in regard to the origin of chronic ocular tuberculosis, for, if living bacilli should reach the aqueous, it is obvious that they would not be held in check as in the blood or tissues, and hence might proliferate. Should they do this, it would greatly increase the chances for metastases to occur in the sclera or elsewhere. Moreover, owing to the large number of bacilli present, the lesions would tend to progress even though

the bacilli were soon killed or inhibited by the immune substances reaching them in their new locations. This may explain the resistance of the lesions to treatment in spite of the fact that they ultimately always heal. The fact that tubercle bacilli cannot be demonstrated in the lesions is no argument against this view, since, as just explained, their acid-fast property may have been destroyed by the action of the immune serum to which they were finally subjected.

The foregoing considerations are suggestive in regard to the treatment of chronic ocular tuberculosis. In the first place they suggest that frequent paracentesis of the cornea would be advantageous in all cases, including cases of iritis as well as of scleritis and keratitis, since it would bring immune serum in contact with the intraocular lesions and probably also with those of the cornea and sclera. They also suggest the advisability of local treatment of the corneal and scleral lesions. This could be accomplished by means of the knife, actual cautery, or possibly by injections of strong antiseptics.[1] Although these latter procedures would result in a certain amount of scarring, this should ultimately be less than if the lesions were allowed to progress without such interference.

CONCLUSIONS.

When dead tubercle bacilli are injected into the vitreous humor or anterior chamber of a rabbit, they produce, after about three months, lesions in the corneo-sclera closely analogous to those of tuberculous sclero-keratitis in man. Smaller tubercles are produced on and within the iris, and still smaller ones on and within the ciliary processes. The latter are of special significance, as they indicate that the foci in human cases of tuberculous cyclitis are not necessarily due to direct metastases from the blood. Tubercles of the choroid are also produced, due to bacilli passing from the filtration angle along the post-choroidal space.

These observations confirm the theory previously advanced

[1] Experiments that I have recently made on rabbits' corneæ indicate that Lugol's solution (1 : 2 : 100) is effective for this purpose, and that it causes remarkably slight scarring. It is also effective for other localized infections of the cornea.

that tuberculous scleritis and keratitis are due to infection from the aqueous humor through the filtration angle. They also strongly suggest that the chronic types of tuberculous iritis and cyclitis, and possibly choroiditis, are likewise due to metastases from the aqueous humor, the bacilli reaching the latter from the vessels of the ciliary body. The lack of immune substances in the aqueous humor no doubt increases the chances for such metastases to occur. In addition, these observations suggest certain procedures in regard to treatment.

TWO CASES OF CHRONIC GLAUCOMA SIMPLEX TREATED BY IRIDOTASIS.[1]

By DAVID HARROWER, M.D., Worcester, Mass.

(With two drawings in the text and Text-Plate X.)

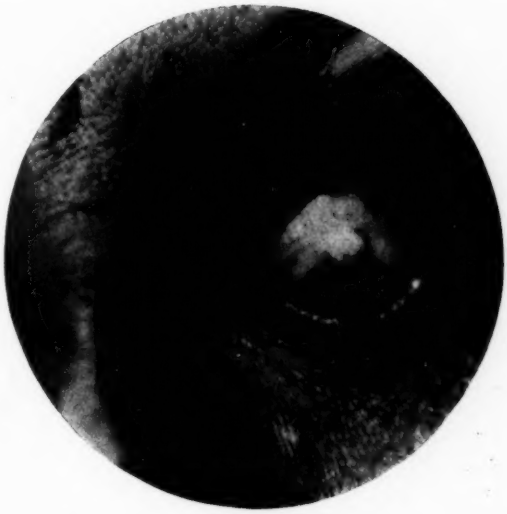
IN the Archives of Ophthalmology, Volume XL., No. 4, page 405, I read a most interesting account of Johan Borthen's operation for the treatment of glaucoma by iridotasis. This, according to Borthen, was a decided step forward from the operation of Holth, who in 1907 reported an operation intended to reduce tension of eyes in glaucoma.

This operation he called iridencleisis. This was intended to produce a fistulous opening between the anterior chamber and the subconjunctival lymph-channels by incarcerating the incised iris in the scleral keratome incision, and allowing the conjunctival flap to heal over it. Borthen says:

"I have always doubted the advisability of incising the iris and making a flap for incarceration, believing this part of the operation to be unnecessary, and convinced that the same effect could be produced by inclusion of a fold of the iris, allowing the posterior surface to coalesce with the subconjunctival tissues, assuring a position of the sphincter external to the section, and with this free drainage. This modification has the advantage of avoiding a step of the operation—incision of the iris—which requires skilful technique and a good assistant to hold the conjunctival flap down on the cornea during iridotomy. If reduction of tension depends on filtration, as I believe, and a fistulous communication is not a *sine qua non*, this modification of mine would afford a simple

[1] Read at the meeting of the American Ophthalmological Society, Washington, D. C., 1913.

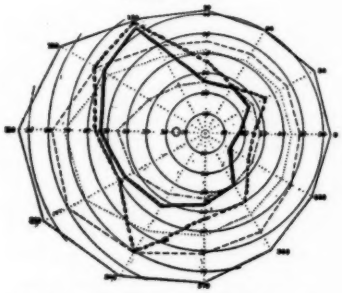
ILLUSTRATING DR. HARROWER'S ARTICLE ON "TWO CASES OF CHRONIC GLAUCOMA SIMPLEX TREATED BY IRIDOTASIS."



Photograph of filtrating cicatrix, Case No. 2.

and effectual substitute for Holth's rather complicated procedure. . . . The operation is performed as follows: The conjunctiva is grasped with fine straight forceps about 10*mm* back of the upper limbus and a cut 2-3*mm* long made in the raised conjunctival fold with ordinary iris-scissors. The scissors are then carried toward the limbus, dissecting a conjunctival flap and keeping as near to the scleral surface as possible in order to include a large amount of subconjunctival tissue in the flap. Care must be taken to avoid fenestrating

Case No. 1.



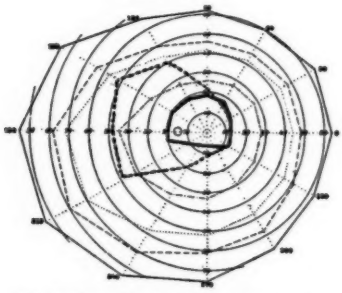
Unbroken line, Field May 17, 1912.
Broken line, Field April 17, 1913.

the conjunctiva near the limbus as this would not only expose the incarcerated iris to infection but interfere with filtration as well. The globe is now held with fixation forceps, and the lance knife, with a stop, introduced about 1*mm* back of the sclero-corneal margin, and carried down through the anterior chamber until the section is 4–5*mm* long. The conjunctival flap can be made by means of the lance knife when making the incision, but dissection with scissors insures the inclusion of subconjunctival tissue in the flap, and I believe this is a matter of practical importance for filtration and the formation of a subconjunctival bleb. The iris is now grasped at the sphincter with the iris forceps, taking up a fold 1–2*mm* wide, drawn out through the section and left there. . . . A drop of atropin, instilled ten minutes before operation, will insure the permanency of the prolapse, and does not cause increased tension, as I have observed."

The only modification I made in this operation, which is a very simple one, is having my assistant grasp the edge of the conjunctiva, and hold it up straight at right angles to the sclero-corneal surface. Then with a keratome make the incision, which I think would be more difficult when the upper part of the cornea is covered with the conjunctiva. One can thus see the knife during the whole incision.

The results that Borthen reports following his cases for a period of from two or three months to two years are remark-

Case No. 2.



Unbroken line Field July 17, 1912.
Broken line, Field April 9, 1913.

able. I have only had an opportunity to do two of these for chronic glaucoma. I have seen no others reported, but the results have been so striking that I wish to draw them to the attention of the members of this Society.

Mrs. M. E. aged 60. Came to me August 14, 1911. The vision of her right eye has been growing dim for the last year or two. She can see simple movements of the hand; the field of vision, is very much limited out, up, and in. The disk is cupped. She has not seen well for a long time with this eye. In the left eye she has $\frac{3}{10}$ + 75 D. ⊃ + 50 D. cyl. ax. 160° = $\frac{8}{10}$. The vision in this eye has been growing dim lately. The disk is cupped. The field limited up and out The tension is +. I gave her pilocarpin 1% to use twice a day.

Aug. 29th. Has improved to $\frac{10}{10}$ (?). That is with a glass.

Sept. 30th. Is about the same. Pilocarpin continued.

Oct. 11th. Is doing nicely. I then gave her aspirin gr. 5, three times a day.

Nov. 14th. I gave her a reading glass and repeated the aspirin.

Feb. 13, 1912. Her vision is not quite so good. $\frac{8}{10}$ with correcting glass.

Mch. 15th. $\frac{10}{10}$ (?) with correcting glass.

May 17th. $\frac{8}{10}$. Field has diminished. Operation advised.

June 15th. Following out Borthen's instruction as near as I could, I did an iridotasis. I found a little difficulty in getting the conjunctiva out of my way, but with my assistant holding this with a pair of forceps I succeeded very well in making my cut with a keratome. This patient had no trouble, no irritation. The whole wound healed very kindly, but with correcting glasses her vision had dropped on August 1st to $\frac{5}{10}$.

Sept. 12th. It was still $\frac{5}{10}$.

I saw her Dec. 18, 1912, and her vision was $\frac{5}{10}$. Her field had enlarged, as you will see here by the various charts that I show you.

I also saw her on April 17th. Her vision was with + 75 combined with + 50, axis at 90°, $\frac{8}{10}$ (?); with + 5.50 combined with a cylinder she could read Jaeger 3. The tension has been normal since the operation.

Through the courtesy of my colleague, Dr. Lovell, on July 17th I saw Mr. O. G., aged 59. He has had chronic glaucoma for six months or more. The right eye has simply perception of light, deep cupping of nerve, and tension +3.

The right eye is $\frac{8}{10}$ (?); central vision; tension + 2.

July 23d. Assisted by Dr. Lovell, I did an iridotasis. This man went along beautifully with the result of $\frac{8}{10}$ vision. The field, as you will see, on July 17th was very limited.

On Aug. 6th, about three weeks after the operation, there was a large increase in nearly all directions of the field.

I present his field on April 9, 1913. The vision has increased to $\frac{10}{10}$ practically.

Of course this does not prove a great deal, as one ought to have more than two cases to report. Still these two cases have been exceedingly gratifying, and I hope, as I see more cases of chronic glaucoma, I will have an opportunity to perform this operation oftener, and hope at some future time to be able to report another series.

THE REPORT OF A CASE OF MICROPHTHALMUS WITH ORBITAL CYST (R.); PARTIAL MICROPHTHALMUS WITH INTRAOCULAR CHANGES (L.).

By F. PHINIZY CALHOUN, A.B., M.D., Atlanta, Georgia.

(*With three figures on Text-Plate XI.*)

THE congenital abnormality of microphthalmus with or without an orbital cyst is of such rare occurrence that the report of a case with histological findings is worthy of consideration.

The condition was first discovered by Arlt in 1858; Talko in 1880, who had observed 7 cases, considered that no communication existed between the cyst and the eye and that it was the intra-uterine cyst which prevented the development of the eye. The abnormality is generally described as being bilateral, and the globe while apparently absent can generally be detected by very careful examination and palpation. There is impaired mobility to the lids and the palpebral aperture is narrowed. Usually there exists a round and fluctuant tumor of the lower lid which can be transilluminated. This swelling causes an ectropion of the lower lid, and on account of exposure the conjunctiva hypertrophies.

Hess and others have proven conclusively that there is definite communication between the cyst and the eye.

Parsons *Pathology of the Eye* mentions two chief theories as the cause of these cysts. That of Arlt, the generally accepted one, is that the cyst is due to the extreme development of ectasia in or about a defectively closed fœtal cleft. Kundrat's theory is that the cyst is formed from a non-invaginated primary optic vesicle. The cyst wall is composed of fibrous tissue derived from the sclera; the choroid is absent; vitreous or embryonic tissue has been found; there are present layers of retina, well defined in some cases (Collins) of a "perverse" arrangement, but usually rudimentary in character.

Arch. of Ophthal., Vol. XLII., No. 5.

ILLUSTRATING DR. CALHOUN'S ARTICLE, "THE REPORT OF A CASE OF MICROPHTHALMUS WITH ORBITAL CYST (R.); PARTIAL MICROPHTHALMUS WITH INTRAOCULAR CHANGES (L.)."

FIG. A. Showing specimen with cyst walls retracted with thumb forceps. 1. Cornea. 5. Cyst wall. 6. Optic nerve. 7. Muscle.

FIG. B. × 2.5 diameters. Globe divided in line of nerve. 1. Cornea. 2. Calcified lens. 3. Degenerated vitreous. 4. Sclera. 5. Cyst walls. 6. Optic nerve. 7. Muscle tissue. 8. Cavity of cyst. x. Choroidal fissure under this mark.

FIG. C. × 125 diameters. Showing remains of choroidal fissure. 1. Sclera. 2. Choroid. 3. Bone. 4. Retina. 5. Choroidal pigment. 6. Cyst wall. 7. Cyst cavity.

On account of certain intraocular defects and the partial microphthalmic state of the opposite eye in the case to be described, I herewith briefly relate the theories advanced in cases of microphthalmus without cysts. Two theories are here advanced: One of defective development, warmly supported by Hess and Collins; another, the theory of intra-uterine inflammation, advocated by Deutchmann. Hess's report of a hyaloid artery surrounded by dense connective tissue, beginning at the papilla and passing forward to be attached to the lens, seems to offer evidence of the developmental theory, for he considers this fibrous tissue to be an atypical development of the vitreous. For the support of the inflammatory theory, much evidence of inflammation exists in the eyes examined, such as posterior synechia, detached retina, hyaline membranes in the anterior chamber and on the iris, bone formation, and retinitis pigmentosa. The following case was recently observed in my clinic and the history was obtained from the mother of the patient, an intelligent negro woman:

History.—John F., age 6, colored, eyes have always been defective and soon after birth there developed an acute purulent inflammation in each eye, lasting four weeks, which was treated by an oculist. This was undoubtedly ophthalmia neonatorum. The mother states that from birth the right eye had always been smaller than the left. There is no history of consanguinity of parents or heredity disease. The health of the father and mother is good and their eyes are normal. The mother has had one pregnancy, brought to full term and born without complications—the case under consideration.

Examination.—The patient appeared to have only a left eye; there was little motion to the upper lid of the right eye, an ectropion with hypertrophy of the conjunctiva of the lower lid, and a very prominent cystic swelling of the lower lid which on pressure was reduced, causing a bulging of the orbital contents. The cyst-like swelling in the lower lid on transillumination appeared translucent. Examining the orbital contents by palpation, a movable mass, about the size of a hazel-nut, could be detected, and by stretching the conjunctiva over this mass a small dark area was seen which I took to be a rudimentary cornea. The case was typical of microphthalmus with an orbital cyst and an enucleation was advised. This was done under ether, dissecting a very contracted globe like phthisis bulbi and a

well-defined, fairly thick-walled cyst; on excising the optic nerve, the cyst wall was cut and the contents evacuated, which consisted of a straw-colored watery fluid. It was observed after the operation that the infraorbital ridge was considerably depressed, to the extent of 6*mm* compared with the horizontal plane of the opposite side. Healing was uneventful, and in time a well-fitted artificial eye was adjusted. The left eye was equally as interesting. The eye in its normal position looked upward, with the lids wide apart, and there existed a rotary nystagmus The horizontal diameter of the cornea was 8*mm*, and the external structures appeared normal except for the smallness of the globe. The pupil would dilate only to 4*mm* after four days of atropine drops, and while under an anæsthetic a very painstaking examination of the fundus was made. The lens was clear except for a posterior capsular cataract. The fundus could be seen very indistinctly on account of white glistening bands of tissue scattered throughout the vitreous. No outline of the nerve head was observed, but, tracing a few retinal vessels to a center, a dark conglomerate area in about the position of the nerve was detected, and from this point into the vitreous there expanded numerous white shiny connective-tissue bands. Throughout the retina and extending as far forward as I could see, were smaller black pigment spots similar to retinitis pigmentosa. There were a few large areas of whitish silvery spots which I thought to be in the retina. There were also regions in the lower segment which resembled old retinal detachments and some of these folds were in communication with the connective-tissue bands spreading from the region of the obscured papilla. From this picture, I was much impressed with the fact that it was of inflammatory origin. Vision was extraordinarily good and the boy had no trouble in finding his way about in strange places and could recognize large objects about a room.

Histological Examination.—The globe and the cyst after enucleation were placed in 10 % formalin solution and when ready for imbedding they were found much shrunken and contracted, making the microscopical examination most difficult and the photographs here presented rather unsatisfactory. The size of the hardened globe (Fig. A) was 10.5 x 12*mm* x 9.5*mm* antero-posteriorly. A discolored area anteriorly (Fig. A1), appearing as the remains of the cornea, measured 6.5*mm* in diameter. The optic nerve (Fig. A6) is shown attached to the side of the globe. It measured 13.5*mm* and was adherent to the outer surface of the cyst wall. The lens (Fig. B2) was displaced, and both it and the vitreous (Fig. 3) had undergone calcareous

degeneration. The cyst wall (Fig. B5) was thin and had been opened posteriorly in a couple of places; in its contracted form it measured 27 x 30*mm*. The outer surface of the cyst showed a little fat and on one border a small mass of muscle tissue. The globe was divided and from one half the calcareous tissue mechanically removed, with a view of retaining the best staining qualities of the tissue remaining and at the same time preserve a good macroscopical mount. Sections were not quite satisfactory. However, they showed a thickened and slightly vascular cornea, with some new-formed connective tissue. The iris was a disorganized mass, leaving a shallow clear space as the remains of the anterior chamber. A small portion of the ciliary body remained and the processes were present. The choroid appeared on an irregularly thickened layer with small patches of bone here and there. It contained a liberal supply of rather large blood-vessels filled with blood; the leucocytes being greatly in excess of the normal proportion. Elements of the disorganized retina were heaped up and fused with the inner layers of the choroid in irregular masses. The sclera was thick and somewhat similar in appearance to that found in phthisis bulbi. A vena vorticosa was observed filled with choroidal pigment. A deposition of lime salts was observed on the outer surface near the nerve. The cyst wall was composed of connective tissue arranged in a manner similar to sclera. The remains of the choroidal cleft was found in the second half of the globe, about 2*mm* below the entrance of the nerve and immediately below the x which will be found in Fig. B. It measured a little less than 1*mm* in diameter and was the only means of communication between the vitreous and cyst cavities. Its lumen was filled with retinal tissue and choroidal pigment which extended but a short distance into the cavity of the cyst. See Fig. C. Retinal elements were not found elsewhere in the sac, though some collections of small round cells were found in the substance of the wall, which might possibly be regarded as the remains of the nuclear layer.

In conclusion, from the microscopical examination of the enucleated eye and the ophthalmoscopical examination of the good eye, there is much evidence of a prenatal inflammation, embryonic structures and changes being, however, considered.

I am indebted to Dr. George S. Dixon of the New York Eye and Ear Infirmary for his careful work in the preparation and report of the specimen.

REPORT OF A CASE OF TRAUMATIC EQUATORIAL RUPTURE OF THE SCLERA.[1]

By Dr. ARNOLD KNAPP, New York.

(*With one illustration on Text-Plate XII.*)

THE following case is noteworthy on account of the atypical site of the rupture and the unusual clinical features associated with it.

Mrs. M. B., 68, on March 29th, fell, striking the left eye against a table. There were wounds of the left upper and lower eyelids near the caruncle, the upper lid in fact being completely divided by an irregular vertical wound.

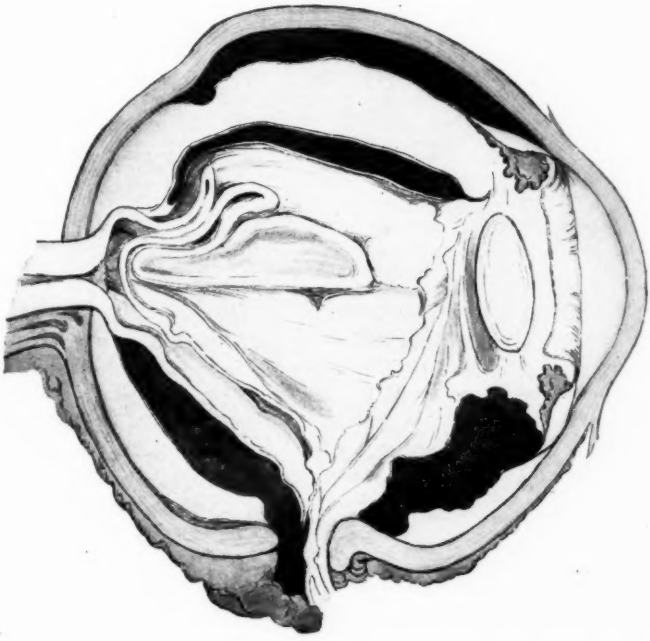
The eye was very red; the anterior chamber was unusually deep, the upper part of the iris especially being forced back; the lens seemed in place, though dislocated backward. No fundus reflex; no light perception; some blood could be seen with oblique illumination in the vitreous. Tension not reduced. No sign of any scleral rupture. After 10 days the redness had become less and, on retracting the upper lid and with the eye looking far down, a bluish, slightly raised area could be seen under the conjunctiva, up and out. The tension remained good. No light perception. As the eye remained inflamed and sensitive, it seemed advisable to remove it.

Enucleation April 15, 1913. On dissection, the conjunctiva was found very adherent up and out in the region of the bluish mass previously noted, and at that point there was an escape of watery, blood-stained fluid. The greatest care was exercised not to cut in to the sclera; the optic nerve was first cut and the adherent area was separated from behind.

The enucleated eye showed an open wound in the sclera just at and running concentric to the equator, about 10*mm*

[1] Specimen presented before the Section on Ophthalmology, N. Y. Acad. Med., April, 1913.

ILLUSTRATING DR. KNAPP'S CASE OF TRAUMATIC EQUATORIAL RUPTURE OF THE SCLERA



long and *2mm* posterior to the rectus externus insertion. Projecting through this was an irregular organized blood clot. The eyeball was divided by an antero-posterior section passing through the equatorial rupture, after hardening in formalin; there was some escape of blood-stained, watery fluid.

The divided eyeball presented the following changes: There was a gap in the sclera, about *10mm* back of the sclero-corneal junction. The scleral edges of the wound were sharply cut, the anterior edge being distinctly everted outward. The gap was filled with blood-stained tissue containing a knuckle of retina. The retina was completely detached and pressed together, no vitreous chamber or vitreous body remaining. The subretinal space was filled with coagulated blood and a blood-stained, watery fluid. There was a moderate choroidal detachment from blood. The lens was in its place, though dislocated backward, resting upon the detached retina. The iris showed a partial retroversion. The anterior chamber contained a grayish exudate.

Scleral ruptures from indirect blows are usually situated in the typical area, 2–3*mm* back and concentric to the corneal margin. Ruptures in other locations are extremely rare. Gruening, in the chapter on "Injuries to the Eye," in Norris & Oliver's system, states that in rare cases the scleral rupture is situated in the equatorial region of the globe, and the lens is dislocated into Tenon's capsule, and cites a case reported by Wadsworth and one by Schlodtmann.

Wagenmann ("Verletzungen des Auges," vol. ix., p. 580, *Graefe-Saemisch*, 2d. ed.), in speaking of variations from the typical scleral rupture, states the ruptures may be multiple or the rupture may run meridionally or at the equator, and in some cases scleral ruptures were found present in the posterior half of the eyeball after enucleation. He cites the following cases of equatorial rupture: Wadsworth, "Luxation of Lens beneath Tenon's Capsule," *Amer. Jour. of Ophth.*, vol. ii., p. 144; Montagnon, "Luxation rare du cristallin," *Arch. d'opht.*, vii., p. 204; Weeks, "Bericht über zwei Falle von Augenverletzung d. stumpfe Gewalt," *Arch. f. Augenh'lk.*, xvi., p. 125. Oeller and Axenfeld have reported equatorial ruptures of the sclera in cases of gouging in the insane (*Zeitsch. f. Augenh'lk.*, i., p. 128).

The clinical features of interest in this case are the preservation of normal tension in an eye with a scleral rupture, and the occurrence of the bluish swelling on the sclera. This swelling proved to be a circumscribed hematoma in Tenon's capsule, over the site of the scleral rupture.

ON THE TREATMENT OF TRACHOMA WITH IODIC ACID.

By Dr. JOSEF RUDAS in Budapest.
(From the Eye Division of the Military Hospital in Krakau.)

(Translated from the *Archiv für Augenheilkunde*, Vol. LXXII., No. 1, 1912.)

IN the March number of the *Archiv für Augenheilkunde*, 1906, Schiele recommended the treatment of trachoma with iodic acid. I have had the opportunity of observing the action of this drug in a large number of cases of trachoma. The iodic acid is prepared, according to Schiele, as follows:

℞ Acidi iodici, gtt. viginti
Gummi arabici (or Aquæ destill.), qu. sat.
ut fiant bacill. No. III.

The drug may also be administered together with acoin, whereby the pain after treatment is diminished.

℞ Acidi iodici, gtt. viginti
Acoini, gtt. duo
Gummi arabici (or Aquæ dest.), qu. sat.
ut. fiant bacill. No. III.

In looking over the case histories, we find that this method of treatment has replaced all others since the year 1906. In comparing the results of the treatment with iodic acid and by other methods, we find that 583 were treated with iodic acid, while 553 were treated by other methods. The most striking feature is that the period of treatment with iodic acid is twenty days shorter than by any other method—the length of treatment being 44.12 days in the former, and 64.47 days in the latter. The number of complications (ulcer and pannus) is .85% to 3.25%, while the disturbances of vision are

0.51% to 3.07% in favor of the treatment with iodic acid. Relapses occur also more rarely, with a difference of 8%. I think these figures show that this form of treatment deserves a trial. Those cases are adapted for this treatment where the discharge has ceased and the inflammatory symptoms have subsided.

The treatment can be said to consist of three phases: (1) Anæsthesia; (2) Cauterization; (3) After-Treatment.

1. *Anæsthesia.* A few drops of a 5% solution of cocain, instilled from 6 to 8 times, at intervals of from one to two minutes, is sufficient to render the conjunctiva insensitive. Subconjunctival injections are, however, more thorough, and the retrotarsal folds are made more prominent thereby.

2. *Cauterization.* To expose the lower retrotarsal fold, the thumb of the left hand is applied to the lower lid, below the eyelashes, and the lid is pulled down while the patient looks up. At the same time the index finger of the same hand presses gently upon the tarsal portion of the upper eyelid, in a direction down and in. The iodic-acid rod is then applied with the right hand. Excessive care is not necessary, even if non-infected parts of the conjunctiva be touched, and this acid does not attack the healthy cornea. The cauterized areas are then wiped dry with a cotton tampon, and the superfluous iodic acid is washed off with a 3% boric-acid solution.

The everted upper lid is again everted by means of a pair of forceps in which one branch is introduced between the eyeball and the once everted eyelid. The forceps is then closed and held in place by the left hand, the patient of course looking strongly down. The cauterization is practised as above described, remembering to cauterize the area which is covered by the branch of the forceps. This is accomplished by simply sliding the forceps to one side. The area is then dried and irrigated. Finally, after removal of the forceps and with the lid once everted, the retrotarsal fold, the tarsal conjunctiva, and the region of the caruncle are cauterized. After cauterization, the follicles appear yellow. If any follicles remain that have not taken on the yellow color, they should be again cauterized, followed, of course, by tamponade and irrigation.

3. *After-Treatment.* As soon as the action of the cocain has worn off, the pain begins, which varies, of course. If it

should be very great, a few drops of cocain can be instilled. Just like any cauterizing agent, a violent inflammation is produced, by whose aid the conjunctiva casts off the parts destroyed by the iodic acid. The lids swell, the conjunctiva becomes hyperemic and covered with necrotic particles. In severe cases the eyes are so swollen that the lids cannot be opened. The patient should remain in a dark room and cold compresses should be applied. Severe reactions are unusual. After one to two hours, the pain is usually relieved. When the inflammatory symptoms have diminished, the conjunctiva presents a clean wound surface. It is particularly important at this time to prevent adhesions between adjoining portions of the mucous membrane. This can be accomplished by separating these adherent parts daily. By applying the right thumb to the lower lid and pulling this lid downward, and with the left thumb on the tarsal part of the upper lid, and also pressing this downward while the patient looks down, the adherent parts easily become separated. The wounded areas are then irrigated with the boric-acid solution. The tendency to adhesion subsides after three to four days. A simple conjunctivitis now remains, which we treat with zinc or some other astringent. The patient is then cured.

In the after-treatment we also use the cupro-citrol salve once and then twice daily.

Results: In the first stage complete recovery. In the moderately severe cases there is a superficial delicate, scarcely visible scar, which is much less than by any other method of treatment. Third, in the severe cases the results are much better than by any other method. According to Schiele, this method of treatment also gives good results in the presence of ulcer and pannus.

A METHOD TO KEEP THE UPPER EYELID AND SUPERIOR FORNIX EVERTED.

By Dr. V. GRÖNHOLM, Helsingfors, Finland.

(With three illustrations in the text, and two photographs on Plate VIII. of the German Edition.)

I HAVE been practicing for several years a method of everting the upper lid, which allows a free view of the entire upper retrotarsal fold, and at the same time leaves the other hand free to carry out any application or examination. The method is so simple that I think it worthy of report.

The upper lid, including the fornix, can be everted and kept in this position either by the aid of the ordinary Desmarres retractor, or with a specially constructed forceps which I call an eyelid everter. A medium-sized Desmarres elevator is applied with its curved spoon-like part applied to the skin of the upper lid, so that the rim of the spoon looks downward. The eyelashes are taken hold of by the other hand, and the lid is carried over the spoon, which in turn is pressed down, and the handle of the instrument is turned backwards towards the forehead of the patient. The lid is thereby suspended upon the spoon and fixed in this position, by the use of one hand, leaving the other one free. It is well for the patient to hold his head a little back, and to look down. The procedure is explained by Photograph 1.

To make this method painless, the size of the spoon must be selected to fit the eyelid. In other words, small and tight eyelids require a small spoon, while large and relaxed eyelids should be everted with a large spoon. Generally a medium-sized spoon is sufficient. The margin of the spoon should be thick, and its surface rather flat. With an appropriate lid-holder, the turning of the lid does not cause the patient any inconvenience. To prevent, in an unruly patient, a closure of

Fig. 1.

Fig. 2.

the eyelid, it is sometimes well to press upon the margin of the lid with the thumb of the same hand which is holding the retractor. This procedure is applicable particularly in trachoma and in a variety of conjunctival diseases. It enables the medicament to be brought directly in contact with the entire mucous membrane. It is well-known with what difficulty applications can usually be made to the upper fornix.

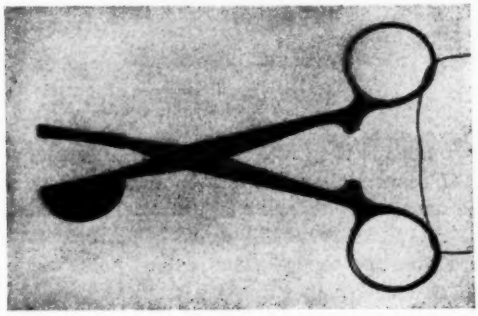


FIG. 1

I have also devised an instrument by which the eyelid is retained in the everted position. This instrument is the ordinary hemostatic forceps of Pean, in which one branch is straight and short, protected with a thin piece of drainage

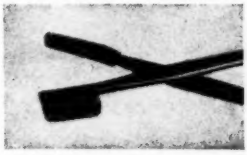


FIG. 2

tube, while the other is a semilunar plate which is thicker on the convex margin than on its base. It is sometimes advisable to have one of the ends of the instrument in the shape of a T-plate (Fig. 2).

In order to expose the inner and the outer angles of the eyelid, it is better to use a plate which is somewhat obliquely

placed (Fig. 3). The method of applying these forceps is seen in Photograph 2.

The eyelashes are clamped between the branches of the instrument, so that the convex margin of the plate looks up.

FIG. 3

The instrument is then rotated through an arc of from 180–250°. The margin of the plate then is found to be applied to the upper margin of the tarsus on the cutaneous side of the lid. The tarsus is spread over one side of the plate, while the fornix is exposed over the other. The patient holds his head back and looks down.

This eyelid forceps has been particularly useful to me in excisions of the conjunctiva in trachoma, in extirpation of the tarsus, etc. Lundsgard has used the instrument in the Finsen treatment of the conjunctiva. Its application does not cause any pain, and but little inconvenience to the patient.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. MARTIN COHEN, Secretary.

MEETING OF APRIL 21, 1913. DR. JOHN R. SHANNON, PRESIDENT, IN THE CHAIR.

Dr. JOHN E. WEEKS presented a patient, male, 63, with **essential shrinkage of the conjunctiva,** whose eye affection began five or six years ago. At the present time the lower cul-de-sacs are almost totally obliterated. The upper cul-de-sacs are somewhat reduced in depth. There is a slight entropion of the lower lids, haziness of the lower portions of the corneæ, the haziness of the left eye covering about one-third of the pupil below and extending to the margin of the cornea above. There is incipient cataract in the left eye. Fundi present no changes. The condition is apparently one of pemphigus of the conjunctiva. There is evidence of a similar condition of the left eye.

Reporting the history of similar cases, Dr. Weeks stated that treatment is of little avail, the natural tendency being toward progression. Operative procedure for the transplantation of cutaneous flaps might be of service in restoring the cul-de-sacs.

Dr. ARNOLD KNAPP asked whether a Thiersch graft, mucous membrane, or skin graft could be used, and what effect a skin graft would have on a normal cornea.

Dr. WEEKS replied he would use a skin graft in these cases, anchoring the flaps to the periosteum; he did not believe that a Thiersch graft would answer the purpose. He had no experience as to what effect a skin graft would have on a normal cornea.

Dr. WEEKS also presented a case of **exenteration of the orbit for lymphosarcoma.** He had performed a Kroenlein operation, removed the growth and lined the orbit with a Thiersch graft. There had been no recurrences so far.

Dr. J. HERBERT CLAIBORNE presented a case he had operated upon for **ptosis,** describing the operation as follows.

The skin being smoothed, the entire lid is clasped in a large clamp. A straight incision is made from the free palpebral border across the extent of the clamp. An elliptical incision, connecting the inner and outer end of the first incision, exposes the tarsus, the skin removed depending in size to some extent upon the effect desired. Generally, it should be from 5 to 8 or 10*mm* at the highest point of the elliptical curve. Five stitches are used, a central stitch and four lateral ones, the central one being made with stouter thread. The needle, having passed through the center of the lower cutaneous margin, is received by the forceps beneath the upper margin, the needle is passed through the tarsal fascia, the point constituting the support upon which to lift the lid. Passing the needle out through the upper lip of the cutaneous wound, completes the central stitch. The four lateral stitches are inserted in a similar manner.

A piece of the tarsus, 15 to 20 x 3 to 4*mm*, in the shape of a parallelogram, is removed at a distance of 3 to 4*mm* from the inferior margin, cutting through the mucous membrane and fenestrating the tarsus; no stitch is taken in the tarsus at all. The stitches are tied together without buckling, and the clamp is removed.

Dr. Claiborne has not found it necessary to undermine the upper lip of the cutaneous wound with scissors. He attributes the good results in this operation, which he has exclusively used for fifteen years, to the fenestration of the tarsus and stitching through the tarso-orbital fascia, and he fails to see why more complicated and difficult procedures should be resorted to.

In the present case, the ptosis had persisted for several years from what appeared to be a third nerve paralysis, the patient being practically unable to raise the lid except for a few minutes. A paralysis of the superior rectus still persists. A slight central elevation of the lid, due probably to the

central stitch having been tied too closely, disappeared about one month after the operation, and the final result is an unusually good one.

Dr. Claiborne claims this to be his original operation in so far as it constitutes modifications and combinations of several other methods, but distinctly different from any one of them singly.

Dr. ROBERT G. REESE found the result in the present case to be excellent, and inquired whether the levator muscle was paralyzed, to which Dr. CLAIBORNE replied that there was a partial paralysis and some paralysis of the superior rectus.

Dr. WEEKS also thought that the levator had some action.

Dr. ELBERT S. SHERMAN presented an unusual case of **atrophy of the retina.** Patient, a female, aged 23, presented the following unusual fundus picture: Atrophy of retina and choroid, large irregular dark brown patches of pigment, sclerosis of choroidal vessels, and partial optic atrophy. Vision has been poor as long as she can remember. There is nothing of interest in her family history except that her parents were third cousins. When 13 years o d, she was treated for anemia and at 15 for rheumatism. Has been under observation for four years, during which time vision has been $\frac{6}{20}$ with each eye. The fields are considerably contracted. Hemeralopia is a prominent symptom.

Dr. W. E. LAMBERT thought it unfortunate that the field of vision was not taken earlier, to which Dr. SHERMAN replied that the contraction was only unilateral.

Dr. ARNOLD KNAPP presented a specimen of **equatorial rupture of the sclera.** (Reported in full in this number.)

Dr. JAMES G. DWYER reported two cases of **ocular nerve paralysis,** because of the fact that the paralysis in each case was due to widely different causes and because he thought the reason advanced as to the cause in the second case cleared up a hard point, namely the occurrence of abducens paralysis in simple mastoiditis.

CASE 1.—Patient, male, was operated upon for a tumor of the bladder under intraspinal stovaine anesthesia, employing the usual technique. He had never had any trouble with his eyes. On the tenth day after the operation he complained of diplopia. Examination showed complete paralysis of the

right abducens, which continued for about two weeks and then went on to complete recovery. Three weeks later the diplopia returned. Examination showed complete paralysis of the left trochlear and abducens, the left eye pointing downward and inward toward the nose. This condition persisted for about 6 weeks, but under strychnine and potassium iodide treatment and daily exercises with prisms, complete recovery resulted. Wassermann negative.

The author thinks this was a case of toxic neuritis, but why the 6th and 4th nerves were singled out, was a question.

CASE 2.—Patient, male, presented all the symptoms of acute mastoiditis, and complained of diplopia for two days. There was complete paralysis of the right external rectus, the side of the affected mastoid. The latter was immediately operated upon and on the following morning the diplopia had practically disappeared. It reappeared in the course of thirty-six hours and had persisted to the present time. Dr. Haskin would explain the probable cause of the paralysis as being due to pressure.

Dr. WILLIAM H. HASKIN had formed a theory as to the relationship of eye conditions in regard to the fundus as well as to the nerve paralyses, based upon an examination of many skulls. In his paper which was now in print, he advanced the explanation for the paralysis of the sixth nerve in acute mastoiditis as being due to involvement of the inferior petrosal sinus, through which the nerve passes. Either pressure on the sixth nerve or interference with its sympathetic nerve supply, controlling vasomotor supply, would explain very simply the condition found.

Dr. ARNOLD KNAPP mentioned the fact that paralysis of the sixth nerve had been noted in acute middle-ear disease by Gradenigo and others.

Dr. DWYER replied that he was aware of that fact, but no explanation had been proven, as far as he knew, for the cause of it. No doubt many cases appeared as simple otitis media or mastoiditis, in which there was an aseptic clot in one or more of the sinuses, the pressure of which may give rise to paralysis without any clinical signs of the clot.

Dr. ANNA WESSELS WILLIAMS, of the Division of Labora-

tories of the New York Health Department, read a paper entitled **Trachoma in New York City school children.**

For the past three years the Research Laboratory of the New York City Health Department has been studying about 4000 cases of trachoma and allied diseases in the New York City school children, including all forms of conjunctivitis, folliculosis, keratitis, ulcers of the cornea, etc. Throughout the course of a large number of cases of hypertrophic and follicular conjunctivitis (often diagnosed as papillary and granular trachoma, respectively), which had been seen and treated from the beginning without operation, there was neither pannus nor scar tissue. A large number of these have been completely cured. The number of cases developing hypertrophic conjunctivitis after acute catarrhal conjunctivitis, was large as compared with those following folliculosis. If all the cured cases were true trachoma, then practically all cases of trachoma seen and treated from the beginning have been cured in a comparatively short time; if they were not true trachoma, then there is practically no trachoma now in the lower city of New York, the reputed hotbed of this affection.

Another complication shows (1) the great prevalence of the group of hemoglobinophilic bacilli in acute, subacute, and chronic conjunctivitis cases; (2) the coincident occurrence of this group of bacilli and trachoma inclusions; (3) the prevalence also of non-hemolyzing streptococci; (4) the rarity of gonococci.

In pure culture, the hemoglobinophilic bacilli show morphologically a cycle of development similar to that of the trachoma inclusions. This fact, together with the coincident occurrence of inclusions and bacilli in the hypertrophic cases, has led the investigators to form the hypothesis that the so-called "trachoma inclusions" are nests of these minute bacilli which have undergone the same change of metachromatic granule production within the epithelial cells as in the pure cultures.

These bacilli probably belong to the great influenza group of organisms in quite a narrow sense, and their variations in virulence may be compared to the group of streptococci. Certain bacteria, especially the frequently found non-hemolyz-

ing streptococci, may help the virulence of these bacilli, while other organisms, such as the gonococcus, may favor a more rapid and favorable course in infections with these bacilli. This might explain the findings of Cohen and Noguchi in cases which contained both trachoma inclusions and gonococci and recovered comparatively rapidly.

The fact of the gonococcus being able, morphologically, to produce trachoma-like inclusions, may explain apparently contradictory findings reported by several investigators.

By instituting home visits, instructing parents in hygiene —especially of the eye,—and by using a card system of individual records, comparatively few subacute and chronic cases have been observed. Such records should be kept everywhere in the City by the Health Board and by all ophthalmologists.

Dr. WEEKS regarded the report as a very interesting one. He considered that the terminology varied and that papillary trachoma did not exist; nor did he believe that the Koch-Weeks bacillus ever caused trachoma.

Dr. PARK, although confessing that he had no special knowledge of eye affections, felt convinced that the work of Dr. Williams was of an excellent character.

Dr. KNAPP could not agree with the statement that there was no cultural difference between the influenza and the Koch-Weeks bacillus. If Dr. Williams's contention is correct, why were not cell-inclusions found more frequently in cases of acute epidemic conjunctivitis (pink-eye)?

Dr. ROBERT G. REESE explained that of all the typical forms of conjunctivitis only trachoma and the inclusion blennorrhea could be transferred to monkeys. Lindner had proved conclusively by his experiments that Prowazek's inclusions are the cause of trachoma. So-called acute trachoma is in all probability a mixed infection. He had never seen pannus develop in a case of "sago grain" variety of trachoma, unless it was operated upon. Careful expression of the follicles, if exuberant, might materially facilitate the cure.

Dr. H. W. WOOTTON stated that the conjunctival affections of N. Y. school children could be clinically classified under five headings:

(1) Folliculosis, where the follicles are scattered over an otherwise normal conjunctiva, without causing hypertrophy, the blood-vessels being visible between the elevations.

(2) Follicular conjunctivitis, in which a watery or mucoid secretion is added to the first named symptoms.

(3) Papillary conjunctivitis, where the conjunctiva is distinctly thickened, the blood-vessels being partly or wholly invisible. Secretion is always present. The surface is red, velvety, and uneven. In this class the so-called trachoma bodies are always found.

(4) Cases presenting scar tissue in the lids, with or without pannus.

(5) Conjunctivitis of the ordinary types.

The first two classes never terminate in cicatrization and corneal involvement; the third class usually clears up with or without treatment after a number of months. The fourth class, however, he would call trachoma, although he did not know what appearance they presented before cicatrization took place. The fifth class required no particular description.

He was certain that folliculosis by itself never terminated in cicatrization, but in some cases the operation of expression was followed by cicatrization and corneal involvement.

Dr. WHITE stated that his experience had been mostly with Indians in the West. He thinks that acute trachoma is due to a superadded infection, that typical trachoma affects the tarsus, and that the genuine affection always leaves some evidence behind on the conjunctiva. He also found eosinophilia in follicular trachoma.

Dr. FRANCIS VALK asked if granular conjunctivitis had been observed unilaterally.

Dr. VON SHOLLY described the way in which the clinical work was carried on in the Ophthalmia School.

Dr. WILLIAMS, in answer to questions, told Dr. Weeks that the pneumococcus had been found comparatively frequently, and the Morax-Axenfeld bacillus infrequently.

In answer to Dr. Knapp, Dr. Williams called attention to the fact that the "Prowazek or trachoma inclusions" had been found in a few acute cases of contagious conjunctivitis. The reasons probably were (1) that both the epithelial cells and leucocytes react more quickly to a recent infection, helping to

produce antibodies for the bacteria, and (2) that the silver preparations these cases receive help quickly to lessen the number of bacteria.

MEETING OF MAY 19, 1913. DR. J. R. SHANNON, PRESIDENT, IN THE CHAIR.

Dr. WALTER E. LAMBERT presented **two foreign bodies,** one removed from the vitreous after having been in the eye for ten years. It was embedded in the remains of the lens and some exudate, which had to be removed by linear extraction, after which the foreign body was withdrawn by means of the small magnet.

In the second case, the patient had been struck by a wooden gate. About a week after the accident, there was a linear scar from the upper margin of the orbit to about one half inch below the inner canthus. Epiphora was the only symptom complained of, and as this seemed to be due to the occlusion of the canaliculus resulting from the wound, it was reopened and probes were passed. This relieved the epiphora somewhat, but a persistent conjunctivitis followed, with a formation of granuloma in the inner cul-de-sac. On removing the granuloma and probing, a sensation of contact with a roughened surface was experienced. The X-ray showed the presence of a foreign body which could not be removed through the original opening through the conjunctiva, nor through an incision made below the supraorbital ridge. Forty-eight hours after, on dressing the wound, a piece of iron (exhibited) was found in the inner lower cul-de-sac. Vision had not been affected.

Dr. JOHN R. SHANNON said that, when the size, form, and position could be determined by the X-ray, the operation of choice would be removal by the anterior portion of the globe. The method to be employed would depend upon the X-ray findings.

Dr. DUANE mentioned a case in which the foreign body was seen with the ophthalmoscope to be lodged in the retina, and was removed by the magnet; twenty-five years later the eye was normal except for a traumatic cataract. In another case, a pistol shot from behind had ruptured the chorioid, causing intraocular hemorrhage, paralysis of the superior rectus, ptosis, and diplopia. The shot lodged in the orbit.

Vision after years remained fairly good. No X-ray was taken.

Dr. JOSEPH B. EMERSON had seen a case of traumatic cataract with a hole in the iris, caused by the explosion of a dynamite cartridge. X-ray examination was negative. The cataract was removed. After six weeks' observation, the eye was enucleated, as it was blind and irritable, and exudate was found containing fine particles of copper and mortar.

Dr. GEORGE S. DIXON said that exceedingly fine particles present in the globe might not be found with the coarse X-ray tube owing to the spreading of the rays. When the foreign bodies were located in the orbit and the eye was quiet, it was a mistake to remove the eye.

Dr. JOHN R. SHANNON presented a patient from whose left eye he had extracted a piece of steel, 4 x 2*mm*, with the Haab magnet, 36 hours after the accident. The X-ray plates disclosed the metal in the lower portion of the vitreous, 11*mm* from the center of the cornea. The steel left the eye through the original wound of entrance, passing through the iris and zonule. A small piece of iris prolapsed and was cut off; the lens was uninjured. Resultant vision one month after the injury: $\frac{20}{30}$ with an astigmatic glass.

Dr. CATESBY JONES reported the case of a man who came to the New York Eye and Ear Infirmary with the history of a piece of steel having hit the eye. V. $\frac{20}{30}$; R. $\frac{20}{20}$. There was a macula corneæ downward and outward, and a hole in the iris outward. The foreign body with few atrophic patches was seen in the extreme periphery. It had entered the eye on January 15th and was removed on April 25th. The eye was quiet when patient came to the infirmary, but later opacity and siderosis developed demanding operation. The Haab magnet brought the foreign body into the anterior chamber, and Dr. Price, performing iridectomy, removed the steel with the Johnson magnet. V. $\frac{20}{70}$.

Dr. H. H. TYSON presented a case of **dislocation of lachrimal glands, associated with Basedow's disease.** Young woman, 25, married, no children, had been ill for about a year, losing strength and about 38 lbs. in weight in two months. Shortly after she noticed a small tumor in each upper lid which was movable. These tumors appeared spontaneously from one

to ten times a day and could also be made to appear by rubbing the upper lids. Under treatment and rest her health improved; she has gained 17 lbs. in weight, feels stronger, and the tumors do not appear as often. The dislocation of the glands seems to have been due to the weakening of the tissues and to a lack of support from rapid absorption of orbital fat.

Dr. GEORGE W. JEAN presented a case of **lymphosarcoma of the conjunctiva.** The patient, male, 55, had noticed a thickening of the lids of his left eye for a year. Examination of the left eye: Skin surfaces of lids slightly edematous. Both lids thickened. On everting the lids, the fornices were found obliterated by an infiltrate filling up the fornices and extending to the lid margins and under the bulbar conjunctiva to within 3*mm* of the limbus below and at the sides, and to within 5*mm* of the limbus above. Over the site of the transition folds a slight sulcus marked the separation of the epibulbar from the palpebral portion of the infiltrate. At the inner canthus the mass filled up the angle and obliterated the caruncle and semilunar fold. The conjunctival surface of the infiltrate was a dark raw beefsteak color, very coarsely granular and rather hard to the touch. Eye movements nearly normal in all meridians. Nothing can be felt at the orbital margins and the eye meets no resistance when pushed back into the orbit. Eye grounds and vision normal. Examination of the right eye: At the upper margin of the upper tarsus 3 or 4 large translucent follicles on the conjunctiva, 2 large follicles on the globe near semilunar fold, and a few in the lower fornix. No posterior symblepharon. Eye otherwise normal.

Blood showed slight lymphocytosis. Wassermann negative. Salvarsan and mercurials had no effect. Tuberculin reaction negative. X-ray examination of chest showed dilated aortal arch and enlarged bronchial glands.

The upper tarsus and overlying infiltrate were resected and some of the mass below was removed In one month the infiltrate had again recurred. A section from the left lid and a follicle from the right eye were submitted to Prof. Symmers and Dr. Riley, who diagnosed lymphosarcoma of the left eye and incipient lymphosarcoma (?) of the right eye, the condition of the latter being very difficult to determine.

This case does not represent the usual type of sarcoma of the limbus conjunctivæ nor an extension from the skin surface of the lids to the conjunctiva. It seems certain that this is a primary or at least a concomitant lymphosarcoma of the conjunctiva, which is a rare condition.

Dr. LAMBERT asked whether there was any involvement of the right eye, to which Dr. Jean replied that a tentative diagnosis of the same condition had been made.

Dr. H. W. WOOTTON presented a man, 25, upon whom he had performed **Kuhnt's external canthoplasty** for pannus 2½ years previously. Had suffered from trachoma for two years and was absolutely incapacitated by dense pannus. Canthoplasty was performed on both eyes, a pedunculated flap from the lower lid being turned into the divided canthus and stitched to the loosened ocular conjunctiva. The upper portions of each tarsal cartilage and a portion of the fornix conjunctivæ were removed. Reaction was very severe. Patient left the hospital at the end of 5 weeks with both eyes open and without any signs of irritation or pannus. These cases are so desperate that the deformity caused by the canthoplasty is of little consequence.

Dr. Wootton also presented a woman of 25, whose inferior temporal vein had been occluded for two weeks. Wassermann and urine negative; blood pressure 150. Commencing vascular degeneration in the other eye. Extending from the periphery to the disk in the affected eye, the retina was edematous along the course of the inferior temporal vein, which was overful and markedly tortuous. The superior temporal vein was also distended. The other retinal vessels were normal. The disk presented a distinct neuritis and two hemorrhages were situated along the vein. Several superficial retinal exudates could be seen through the retinal edema. A few floating opacities in the vitreous. The case was as yet incomplete and the tuberculin reaction would be worked out later.

Dr. KNAPP: The second case of Dr. Wootton's is very interesting. I do not see how we can reconcile the condition as the result of a vascular sclerosis. The clinical picture, with exudation, hemorrhage, and dilated vein, suggests an infectious process, and not the result of a phlebosclerosis.

One can not but be surprised at the number of cases of retinal lesions which in the last years have been brought into relationship with tuberculosis, and in many of these the main characteristic was a lesion of the veins. I do not think because a patient appears healthy that that excludes a chronic tubercular process. Furthermore, in these cases we have with the ophthalmoscope an excellent means of observing characteristic local changes after a positive tuberculin injection given for diagnosis.

Dr. KNAPP presented a patient with **trachoma follicles in the cornea.** Just below the upper margin of the cornea there were three slightly elevated, translucent, round infiltrations situated underneath the blood-vessels of an old pannus. The patient was a woman of forty years, who had had trachoma for a number of years. She had been operated upon about five years ago, by an excision. Though the conjunctiva of the lids showed no evidences of active trachoma, she developed from time to time very severe attacks of intense blepharospasm and photophobia. Dr. Knapp thought that these attacks were due to the trachoma of the cornea and that, furthermore, this case illustrated the possibility of a trachoma of the cornea existing as the direct extension of a trachomatous process along the scleral conjunctiva.

Dr. TYSON remarked that Dr. Herman Knapp had reported a case of trachoma of the cornea.

Dr. H W. WOOTTON had excised the conjunctiva and tarsus in a few cases where follicles of the cornea appeared after some time. Tuberculin treatment had improved some of these cases.

Dr. DIXON inquired whether trachoma bodies were demonstrable in the present case.

Dr. KNAPP, in closing the discussion, said that inclusions have been found in the corneal epithelium, but as the corneal process was so old he did not think it probable that the inclusion cells could be demonstrated.

Dr. GEORGE YOUNG presented a patient, in whom a hollow style inserted for lachrimation disappeared in the tissues. The style had not been removed for a period of three years and had sunk deeper and disappeared, followed on manipulation by swelling and redness.

Condition on admission: Apparently dacryocystitis O. S., canaliculus slit; X-ray reveals presence of foreign body.

Meller's operation. The probe touched metal and disclosed a long false passage. Forceps proved unavailing. The X-ray picture (Dr. Dixon) showed a rotation of the foreign body by 180° and impaction under dense fasciæ. The strabismus hook proved an excellent expedient. The fasciæ were severed with a scalpel and by torsion of the hook the end was rotated forward and the foreign body extracted with ease. Removal of cul-de-sac piece-meal; curettement of duct and cupola; pressure bandage. Healing well. The author emphasizes (1) the value of the X-ray pictures and the need of studying them in even apparently simple cases; (2) the difficulty of the operation, being as tricky as removing a fish-hook; (3) the need of being prepared for a general anesthesia, the process being extremely painful.

Dr. J. HERBERT CLAIBORNE presented a case of **abscission of the cornea.** Young woman gave a history of frequent attacks of phlyctenular keratitis, followed by perforations of the cornea, which caused a marked anterior staphyloma. This condition warranted the operation of abscission of the cornea with suturing of the sclera, after removal of the cornea and lens. After about two weeks a glass eye was prescribed, resulting in excellent movements of the eyeball from side to side.

Dr. TALBOT R. CHAMBERS asked whether Dr. Claiborne would perform the same operation in similar cases due to other diseases of the cornea, to which Dr. Claiborne answered in the affirmative.

Dr. W. B. WEIDLER presented a patient with **detachment of the retina and chorioid with linear rupture of the chorioid.**

Patient, 21, received a fist blow in the left eye seven years ago and was knocked to the ground.

Ophthalmoscopic examination: O. S., media clear, disk oval, 7 x 8 long, axis 90°. Scleral ring all around, absorption conus all around, central excavation small. Upper and inner quadrant of fundus normal, disk slightly pale. There are two long linear tears in the chorioid, one at axis 180° nasal, and the other at 65° temporal, being fine and narrow near the disk and getting wider toward the periphery of the fundus.

Traveling forward in the lower half of the eye, the retina and the chorioid detachment are seen involving almost the complete lower half of the eye. The detachment is a flat one, and the chorio-capillaris of the chorioid is seen on apparently the same level as the detached retina. Very far forward near the ora serrata, several pearly gray areas are seen where the retina shows a detachment from the chorioid. Transillumination fails to show any shadows or obstruction of the light in any portion of the detachment. This may have been due to a subchorioidal hemorrhage at the time of the blow or to some exudate. It is hardly due to a melanotic sarcoma, but it might be a leucosarcoma growing between the two layers of the chorioid.

Dr. MARK J. SCHOENBERG asked whether the field of vision was taken, to which Dr. Weidler answered in the affirmative.

Dr. KNAPP: This case seems to me to be that of a variety of retinal detachment which is characterized by a perfectly clear subretinal fluid, and where the curved margin of the detachment presents chorioidal changes and often a white line in the retina, evidently due to a fold of the retina. He did not think that this should be regarded as a case of chorioidal detachment. In his reçollection, he had never seen a chorioidal detachment in which the ophthalmoscopic picture gave the reflex of the normal chorioid.

Dr. J. HERBERT CLAIBORNE reported a case of **sudden bilateral blindness following a fit of anger, with resultant permanent bilateral central (paracentral) scotoma.** Patient was a young man, 19 years old, apparently of good habits. On coming home one evening, he quarreled with his father-in-law, who was a drunkard, and next day he became suddenly blind. According to the history of the case, he never touched any liquor, showed no physical defects, and both urine and Wassermann were negative. Functional examination showed a bilateral central scotoma.

. Dr. Claiborne went into the anatomy of the optic nerve fibres and of the maculo-papillary bundle of fibres in the optic nerve, chiasm, and tract. He thought that this fit of anger caused a temporary congestion or swelling of the pituitary body and thereby pressure upon the maculo-papillary bundle of fibres, resulting in a permanent pathological condition.

Dr. DUANE had had a case of recurrent spasm of the retinal artery in both eyes, causing blurred vision and a paracentral scotoma. The affection first involved one eye and then the other. The arteries were contracted and the veins became dilated with amyl nitrite. It occurred after a fit of excitement.

Dr. SCHOENBERG believed that Dr. Claiborne had not proved the point to the entire satisfaction of scientific accuracy. The pituitary gland had a very intimate connection with many parts of the organism, and a sudden swelling of it ought to have produced a series of disturbances traceable to that gland. If Dr. Claiborne had presented the results of investigations of this kind, showing by the blood pressure, carbohydrate tolerance, blood and urine examinations, etc., that there were changes present suggesting an acute disturbance of the hypophysis, he would have worked out a classical first case on record.

Dr. TYSON inquired whether Dr. Claiborne could positively exclude toxic substances as a cause, as the description of the fundus given by him was quite typical of the cases produced by wood alcohol, and the symptoms were quite similar.

Dr. CLAIBORNE answered that toxic substances as a cause had been excluded.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. C. DEVEREUX MARSHALL, F.R.C.S., London.

CLINICAL MEETING, WEDNESDAY, MAY 7, 1913. SIR ANDERSON CRITCHETT, BART., C.V.O., PRESIDENT OF THE SECTION, IN THE CHAIR.

Mr. N. Bishop Harman showed a case of **exenteration of the orbit,** with partial excision of the maxilla and ethmoid for rodent ulcer. The woman had first seen the rodent ulcer seventeen years ago, and she treated it herself with caustics. It frequently recurred, and nine years later was as large as a farthing. She then had X-rays at every recurrence for four years. Next, zinc ions were used, followed by radium for nine months. When sent to him for operation, the ulcer was as large as a penny, and was fixed to the bone. Ultimately, an extensive operation had to be performed, and the growth was found to have extended into the orbit and the bony walls. Mr. Harman said none of the newer measures for the treatment of rodent ulcer could compare with the knife for certainty and security, and the knife was infinitely less costly than any other method. Had this growth been excised in the first instance, the woman would have escaped the necessity for this severe operation, and would have preserved to herself two sound eyes.

Mr. Harman also showed drawings of a case of **extreme hyperphoria,** for which he had operated by his new method of subconjunctival reefing. The patient, a woman æt. 28, had

been a martyr to severe headaches since school days, and could obtain no relief from them. Examination of the eyes revealed hyperphoria or latent vertical squint, requiring a 15° prism to correct. It was impracticable to wear such a high degree prism. Concluding from other signs in the case that the left superior rectus was at fault, he operated, shortening that tendon by his new method. She had now orthophoria to every test, and the headaches had completely ceased. Seven months had elapsed since the operation, and the result was perfect in every way.

Mr. EDGAR CHATTERTON showed a case of **tuberculous iritis in both eyes.** The boy noticed that his sight was bad when at school thirteen months ago. He had never had pain, and there was no history of tubercle or syphilis. Two months ago he had yellow vascular nodules in both irides at the angle of the anterior chamber, posterior synechiæ, keratitis punctata, and vitreous opacities. He was now having tuberculin injections $\frac{1}{1000}$ of a *mg.* once a week, and frequent tappings of the aqueous. The condition had improved on that treatment.

Mr. SYDNEY STEPHENSON showed a case of **ocular torticollis** in a boy æt. $13\frac{1}{2}$. At three months of age, when recovering from whooping-cough, he held his head towards the left shoulder, and that habit had persisted. While he was in the wry-neck posture there was no squint or diplopia. But when he straightened his head the right eye turned upwards and outwards, and vertical and contortional diplopia developed.

Mr. G. H. POOLEY and Mr. HAROLD GRIMSDALE showed cases of **angioma of retina,** and Mr. Pooley also exhibited a case of **giant-celled sarcoma,** in which there had been several operations for recurrences, the last in November, 1911, since which date there had been no further appearance of the disease. The President commented on the present procedures as a great advance on the days of removal followed by the application of caustic zinc paste to the remaining surface of the wound.

Mr. H. HERBERT showed a case of **third nerve paralysis with rhythmic clonic spasm.** In this case no divergence was to be seen, but there was the same absence of strabismus

as in congenital paralysis of the sixth nerve. The synchronous raising of the lid to the normal extent was due to spasm of the unstriped levator muscle, which was innervated by the sympathetic.

Mr. H. J. FISHER exhibited a case showing **arterio-venous communication in the cavernous sinus,** successfully treated by ligature of the common carotid. Mr. Elmore Brewerton, discussing the case, pointed out the reason why the internal carotid should be tied in preference to the common carotid, and said he thought that measure would be followed by more cures, and less cerebral complications.

Mr. ERNEST CLARKE presented a case showing an **unusual arrangement of opaque nerve fibres.** The patient was a myopic youth æt. 20. There was a peculiar ring round the disk, bulging forward, giving to the disk a crater-like appearance. Opaque nerve fibers spread from all parts, and partly involved the macula.

Mr. R. CRUISE showed three instances of **trephining combined with insertion of thread in glaucoma,** the object of this being to increase the area after trephining. The aqueous filtered along the course of the thread, and did not cause inconvenience. He explained that the procedure was on its trial. The President said one of the cases shown he sent to Mr. Cruise for treatment, expecting that enucleation would have to be performed, but from T+3 the tension was now found to be normal or even sub-normal, and the pain had gone.

Mr. RICHARDSON CROSS (Bristol) showed a **pigmented growth of the conjunctiva.** The general impression was that free excision, followed by the galvano-cautery to the residue, should be done.

The ordinary meeting of the Section was held on Wednesday, 4th of June, under the presidency of Sir Anderson Critchett, Bart., C.V.O.

Mr. COLE MARSHALL showed a case of **uncommon type of cataract** in a child. Mr. BISHOP HARMAN brought forward a case of **melanotic growth,** which seemed to originate in the iris. Mr. JESSOP inclined to the view that it sprang from the ciliary body, and pushed the iris on one side, causing flattening of

the edge of the pupil. He agreed that it was a melanotic sarcoma. Mr. TREACER COLLINS mentioned a case of melanoma of the iris, malignant characters having arisen later. He agreed with Mr. Jessop that in the present case the origin of the growth was probably the ciliary body. A possibility in Mr. Harman's case was that it was a cyst, such as Mr. Coats described, with agglutination of the ciliary processes.

Mr. BISHOP HARMAN also showed a case of **spontaneous recovery from detachment of the retina.** The patient had had complete detachment for three months, and during it she was in bed three times; she refused operation. Shortly after that date the sight suddenly came back, and now there was no trace of any detachment; all that could be seen were one or two cobwebby lines in the disk. She had $\frac{6}{36}$ one-letter vision. She had 10 D of myopia, but there had been no accident of any kind. She was a cook in a good family, and one February night she walked out from a hot room to the cold air, and her description was that something black suddenly fell over her eye, and she could not see anything more with it.

Mr. GOUDIE described the case of a child which came to Glasgow Eye Infirmary with detached retina, and in whom three months later the retina became re-attached. Two months afterwards it again became detached, only to again become attached. There was fair vision, and no iritis.

Mr. RAYNER BATTEN said he had a case with nearly 20 dioptries of myopia and detachment. Detachment occurred also in the other eye, and the patient was so blind for a year or two that she had to be led about. Later she came and said she saw a glimmer of light and from that date her sight began to return; she accepted her lenses again, and was able to find her way about. He believed her vision was $\frac{6}{24}$.

Mr. HERBERT PARSONS said he, like others, was sceptical about spontaneous recovery from detachment being possible, until he had a case which altered his view. It occurred in hospital, and though a little later the patient was very carefully examined, no trace of the detachment could be detected, not even streaks to mark what had occurred; eighteen months later, however, he came with a relapse.

Mr. MACNAB described a case of double detachment which

underwent spontaneous cure. In another case in which the condition occurred there had been irido-cyclitis, and he believed it was due to tubercle of the eye; there was a large vitreous opacity, and very extensive detachment; the eye was very soft, being practically devoid of tension; the cornea could be seen to be dull and crinkled. Vision was reduced to mere perception of light. He gave tuberculin, and a vaccine cultivated from the patient's own coli bacilli. For four months now the tension had been normal, and the patient could count fingers at 5 or 6 metres.

Mr. JESSOP reminded the meeting that when the Ophthalmological Society discussed the subject only one case was reported as having been cured, and that was spoken to by Mr. Nettleship and Sir John Tweedy. Many cases of cure of the condition had been reported, but they had not been lasting.

Mr. ORMOND did not share Mr. Jessop's scepticism, and described a case of his own, in a patient who had been treated by glasses for high myopia, and a little later she said her vision suddenly went in one eye. She had obvious detachment of the outer side of the retina. He did a sclero-puncture, and removed some fluid, and in three days the detachment had disappeared. He had seen her a number of times since, and the attachment remained absolute. Vision was $\frac{6}{36}$.

Mr. LESLIE PATON reminded the meeting that Mr. Harman's case was one of spontaneous re-attachment, not after operation. He was more optimistic than Mr. Jessop on the subject. He had seen a case of 35 years' standing cured after operation, though it was a double case. In another case, that of a lady with 15 D of myopia, and vision $\frac{6}{18}$ in either eye, there was detachment in one eye, resulting in blindness, and that was followed by detachment in the other eye. After operation, her vision was better than before the detachment. In the case of a girl with detachment, she was put on her back and treated with mercury and iodide, and in three months the retina had become re-attached, leaving only a curious distribution of retinal pigment. In a series of 28 cases of detachment which he had looked up, 7 were cured.

Mr. NETTLESHIP and Mr. JESSOP suggested that in the

near future a further discussion on the subject should be held by the Section. Mr. Nettleship said he had records in his case-books of several cases of detachment which had recovered.

Mr. CUNNINGHAM showed a case of **nystagmus with uniocular fixation.**

Professor WORTHINGTON, F.R.S., gave a contribution and demonstration on **An experimental study of normal monocular polyopia.**

Mr. G. H. POOLEY showed a case of **cyst of the iris** and Mr. GOUDIE a case of **corneal ulceration,** the discharge from which contained fusiform bacilli and spirillæ resembling those found in Vincent's angina. Dr. FREELAND FERGUS presented a communication entitled **Glaucoma associated with venous congestion.**

Mr. BISHOP HARMAN submitted a paper on **The education of high myopes,** the experience of four years. It was an account of the working of a scheme for the safe education of children with such a degree of myopia that they were not fit for the ordinary school curriculum, yet were not bad enough to require the teaching for the blind. In any scheme of compulsory education, there must be provision for misfits, and for none was this more necessary than for high myopes, who often had great intelligence and hence were in danger of damaging their delicate eyes by over-application. He explained the method of selection of cases and their transfer to centers for special instruction. The curriculum fell into three parts: (1) oral, the children being associated with scholars of the ordinary school for subjects which could be taught orally; (2) literary work, which was learned not by books, pens, or paper, but by blackboard and chalk, the writing to be done free-arm fashion; (3) a full use of the handicrafts which would develop attention and concentration with a minimum use of the eyes. His conclusion was that a suitable system of teaching myopes could be arranged and satisfactorily carried out. Such classes should not be independent units, nor be associated with existing blind schools, but should be integral parts of existing elementary schools. Their success depended almost wholly on the intelligence and initiative of the teachers, who were required to do real teaching. The training of these children should be general, not merely technical. The classes

should be of small size, with an optimum number of a dozen per teacher, and there should be a standard of visual acuity of $\frac{6}{6}$ with suitable glasses. The children should also be under regular medical supervision during the whole of their school life.

QUARTERLY REVIEW OF THE PROGRESS OF OPHTHALMOLOGY.

By H. KOELLNER, Berlin; W. KRAUSS, Marburg; R. KÜMMELL, Erlangen; W. LOEHLEIN, Greifswald; H. MEYER, Brandenburg; W. NICOLAI, Berlin; H. PAGENSTECHER, Strassburg; K. WESSELY, Würzburg; and M. WOLFRUM, Leipsic, with the Assistance of Drs. ALLING, New Haven; CALDERARO, Rome; CAUSÉ, Mayence; DANIS, Brussels; GILBERT, Munich; GROENHOLM, Helsingfors; v. POPPEN, St. Petersburg; TREUTLER, Dresden; and VISSER, Amsterdam.

THIRD QUARTER, 1912 (*Concluded*)

Edited by Dr. MATTHIAS LANCKTON FOSTER, New Rochelle.

XXII.—OPTIC NERVE AND VISUAL TRACT. Reviewed by MEYER.

411. MOISONNIER. **Optic neurtitis of gouty origin.** *La clinique ophtalmologique*, iv., p. 414.

412. SIEGRIST. **Choked disk and its operative treatment.** *Korrespondenzblatt f. Schweizer Aerzte*, xlii., p. 521.

413. VOLLERT. **Three cases of extreme choked disk after injections of salvarsan for syphilis.** *Muench. med. Wochenschr.*, p. 1690.

414. ZANI e DEL LAGO. **Infantilismus from a tumor of the hypophysis.** *Annali di Ottalmologia*, fasc. 7, 1912.

MOISONNIER (411, **Optic neuritis of gouty origin**) observed a bilateral retrobulbar neuritis in a very corpulent man 43 years old, who had suffered from a number of typical attacks of gout in the course of some years. The visual disturbance set in quite suddenly, within a few hours, first in one eye and a week later in the other; it consisted in each eye of an oval central scotoma of from 15° to 20° in extent. Local treatment consisted of subconjunctival injections, general treatment of purgatives, regulation of the diet, bleeding salicylic acid, and colchicum. Complete recovery took place within four weeks. He believes this to have been a true toxic disease of the optic

nerve induced by the still unknown toxine that acts in the attack of gout.

SIEGRIST (412, **Choked disk and its operative treatment**) gives his personal experiences in the palliative treatment of choked disk. Of the various theories which have been advanced to account for the origin of choked disk he considers the one brought forward by Schieck to possess the greatest degree of probability. When syphilis is the cause he recommends lumbar puncture in addition to mercurial inunctions. An intervention is naturally first to be made when the vision falls. If a positive diagnosis of tumor has been made no time should be lost after puncture of the spinal cord, but a trephining should be done quickly. When the tumor cannot be accurately localized, the right parietal bone should be trephined, because the injury will be least at this place.

VOLLERT (413, **Choked disk after salvarsan**) observed three cases in which papillitis appeared a short time after an injection of salvarsan had been given. He believes that such affections are more frequent after the use of salvarsan than they were when mercury was the only remedy employed; hence he recommends to limit the use of salvarsan and to always try inunctions with mercury first.

The patient of ZANI E DEL LAGOS (414, **Infantilismus from tumor of the hypophysis**) had total blindness of the right eye with atrophy of the papilla, and temporal hemianopsia of the left eye with paleness of the nasal side of the papilla. The right optic tract and the inner part of the left were destroyed as the result of a fracture of the sella turcica, as determined by radiography. The tumor of the hypophysis, which appeared shortly before puberty, was accompanied by headache, tinnitus aurium, dizziness, nausea and vomiting, and by a sudden inhibition of development.

XXIII.—ACCIDENTS, INJURIES, FOREIGN BODIES, PARASITES.

Reviewed by MEYER.

415. v. HIPPEL. **Extraction of bits of copper from the vitreous chamber.** *Klin. Monatsbl. f. Augenheilkunde*, July, p. 52.

416. NATANSON. **A case of evulsio nervi optici.** *Ibid.*, August, p. 220.

417. ODINZOFF, W. **Siderosis of the eye.** *Westn. Ophth.*, July, 1912.

418. PICHLER, A. **Rupture of the chorioid as the probable cause of a high myopia.** *Klin. Monatsbl. f. Augenheilkunde*, September, p. 342.

v. HIPPEL (415, **Extraction of bits of copper from the vitreous**) advises that the extraction of bits of copper should be undertaken as early as possible after the accident. He has operated on 15 cases, on 7 with success, in so far as the eyeball was preserved. The vision in 5 of these was $\frac{5}{5}$, $\frac{1}{25}$, $\frac{5}{15}$, $\frac{5}{200}$, and $\frac{5}{7}$, in 2 it was perception of light and good projection. All of the eyes saved are free from irritation and have normal tension. The period of observation is too short as yet to enable it to be determined whether the preservation of vision is permanent or not.

NATANSON (416, **Evulsio nervi optici**) describes a case of injury that he observed. The absence of the papilla with its vessels, the hole in the place where this should have been, which was surrounded by a margin formed of a scleral ring and a zone bared of the retina, the ending of the retinal vessels at the edge of this zone, and the amaurosis that immediately followed the injury form the basis for the diagnosis evulsio nervi optici.

The diagnosis made in the patient of ODINZOFF (417, **Siderosis of the eye**), 43 years old, was: O. D., synechiæ posteriores; O. S., atresia pupillæ, glaucoma consecutivum. The left eye had been diseased for a year and a half. The conditions when the patient came under observation were: O. S., injection; cornea clear; anterior chamber shallow; color of the iris changed; capsular cataract; vision zero; eyeball tender to pressure. O. D., Slight injection; posterior synechiæ; opacity of the vitreous; vision $\frac{1}{1000}$. The left eye was enucleated. Four months later the condition of the right eye was: occlusio pupillæ; vision $\frac{1}{8}$. Examination of the enucleated eye revealed atrophy of the iris, of the ciliary body, and of almost the entire sphincter; the pupil occluded; chronic proliferating inflammation of the vessels; degeneration of the retina; glaucomatous excavation of the papilla; cortical and capsular cataract; siderosis of the cornea, iris, lens, and pars ciliaris retinæ; occlusion of the sinus of the anterior chamber; degenerative and proliferative changes in the pigment epithelium. The presence of iron in the tissues of the eye corresponded exactly with the description of siderosis made by v. Hippel. No granules of iron pigment could be discovered in the conjunctival cells that covered the

cornea and iris. The neuro-epithelium was greatly changed, as was also the pigment epithelium. At the periphery of the retina the rods and cones were completely wanting, the cells of the pigment epithelium were proliferated into the retina. At the posterior pole the signs of degeneration were less marked. Apparently the changes in the pigment epithelium depend on the disappearance of the neuro-epithelium, just as in retinitis pigmentosa, and only secondarily on the presence of iron. When the piece of iron penetrates only into the anterior part of the eye, a siderosis very rarely develops; it usually gives rise to a cataract. V. POPPEN.

PICHLER (418, **Rupture of the chorioid as the probable cause of a high myopia**) describes the onset of a myopia of 14 D. in a patient after a contusion. The refraction of the other eye was +1.0 D. The ophthalmoscopic condition of the myopic eye was peculiar. The papilla was transversely oval and surrounded by a ring of pigment which was particularly broad and marked above and below. The impression given by the condition as a whole was that a compression and consequent rupture of the fundus of the eyeball had taken place under the influence of an external force, and to this the writer ascribes the origin of the myopia.

FOURTH QUARTER, 1912.

Edited by Dr. MATTHIAS LANCKTON FOSTER, New Rochelle.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE (BOOKS, MONOGRAPHS, HISTORICAL ESSAYS).

Reviewed by WESSELY.

419. AXENFELD. *Textbook of Ophthalmology.* Third edition.
420. ROEMER. *Textbook of Ophthalmology in the Form of Clinical Lectures.* Second revised edition.

For the review of AXENFELD'S **Lehrbuch der Augenheilkunde** (419) see the March number of the ARCHIVES, Book Reviews, page 221.

Nothing of the prolixity that marked ROEMER'S first edition (420, **Textbook of Ophthalmology**), is to be found in the second, so that although its contents have been enriched it has been considerably reduced in size, and made clearer and handier.

II.—RELATIONS OF OPHTHALMIC TO GENERAL DISEASES, INCLUDING POISONS. Reviewed by KOELLNER.

421. BAHN, O. A. **The moving picture and the eye.** *New Orleans Med. and Surg. Jour.*, Oct., 1912.

422. BOSSIDY, J. C. **A case of uniocular polyopia existing in both eyes.** *Jour. Amer. Med. Assoc.*, Sept. 21, 1912.

423. BOURLAND. **Two cases of optic neuritis due to malaria.** *Annales d'oculistique*, cxlviii., page 362.

424. CALHOUN, F. P. **Eye complications caused by hookworm disease.** *Jour. Amer. Med. Assoc.*, Sept. 21, 1912.

425. FRIEDMAN, L. **Temporary toxic amaurosis and paralysis following injection of ethyl alcohol into a chronic empyema sinus.** *Ibid.*, Nov. 13, 1912.

426. GIFFORD, H. **A case of the juvenile form of family amaurotic idiocy.** *Ophthalmic Record*, Nov., 1912.

427. HEINE. **Tuberculosis and tuberculin.** *Med. Klinik*, No. 44–45.

428. KASASS, J. J. **Pathology of methyl-alcohol amaurosis.** *Diss.*, St. Petersburg, 1912.

429. LIÉGARD and OFFRET. **Wassermann's reaction in interstitial keratitis, irido-chorioiditis, oculomotor paresis, and optic atrophy.** *Annales d'oculistique*, cxlviii., p. 422.

430. POLET. **Ocular troubles following affections of the teeth.** *Annales belge de stomatologie*, Nov., 1912.

431. STRAUB. **An ophthalmological contribution to the doctrine of scrofulosis.** *Ophthalmoscope*, Nov., 1912.

432. TYSON, H. **Amblyopia from inhalation of methyl-alcohol.** *Trans. Amer. Ophthal. Society*, 1912.

433. ULBRICH. **Demonstration of a patient with a high degree of lipæmia.** *Wien. ophthalm. Ges.*, 1912.

434. WOLTON, C. B. **A case of quinine amblyopia.** *Annals of Ophthalm.*, Oct., 1912.

435. WOLTON, C. B. **Hemorrhage as the cause of blindness.** *Illinois Med. Journal*, Nov., 1912.

436. WOOD, C. A. **Nasal hydrorrhea** *Jour. Amer. Med. Assoc.*, Sept. 21, 1912.

437. ZENTMAYER, WILLIAM. **Visual disturbance from distant hemorrhage.** *Ibid.*, Sept. 21, 1912.

BAHN (421, **The moving picture and the eye**) has found injection of the lids, lachrymation, retinal fatigue, pains in the eyes, headaches, muscæ volitantes, and dizziness in patients who had been watching moving pictures. He believes that the moving picture is a decided strain upon the eyes, especially if any refractive or muscular error is present.

ALLING.

BOSSIDY'S (422, **Uniocular polyopia in both eyes**) patient

was a girl of 14, who had perfect vision with correction for myopic astigmatism. The ocular muscles were paretic. A cycloplegic did not eliminate the diplopia. Later she said that she saw four objects with each eye. The polyopia was evidently of hysterical origin.

ALLING.

WOOD (436, **Nasal hydrorrhea**) thinks that nasal hydrorrhea is a symptom and not a disease. In the majority of cases there is optic atrophy. He believes the discharge to be cerebro-spinal fluid. The underlying cerebral disease is frequently hydrocephalus, and the increased pressure gives rise to seepage of fluid through one or more nasal openings.

ALLING.

GIFFORD (426, **Juvenile form of family amaurotic idiocy**) recites the case of a girl who, at the age of 7, began to fail in mental condition and to lose her sight. When examined she was 11, and was abnormally quiet and childish. There was eccentric fixation, but sufficient vision to enable her to find her way about. Divergent strabismus and slight nystagmus were present, and there were dust-like opacities in the vitreous. The nerves were atrophic. Masses of pigment that resembled, but were larger than, those of retinitis pigmentosa could be seen. Four years later the child died totally blind in a hospital for the incurable insane. An older brother had a similar history. Five other children in the family were healthy. He also speaks of four children in another family who developed normally up to the age of 7 or 8, and then were obliged to drop out of school on account of failing vision and lack of mental ability. Similar cases are well known and have been reported by Batten, Mayou, Vogt, Oatman, and others. Most observers agree that these cases are allied to the infantile form of family idiocy. The pathological condition of the brain is essentially a degeneration of the ganglion cells. There have been only three microscopical examinations, and they showed complete degeneration of the rods and cones as well as of other layers of the retina, thus differing from the infantile form, in which the rods and cones are found to be normal.

ALLING.

HEINE (427, **Tuberculosis and tuberculin**) divides the clinical picture of tuberculosis of the eye into the typical and

the atypical forms, the latter including those cases in which the cause may be tuberculosis in the absence of other etiology, while the former comprises those that are produced only by this disease. Among the former are included certain forms of little gray nodules in the region of the circulus iridis minor and the margin of the pupil, which can be mistaken for nothing else. Among the atypical forms are certain varieties of parenchymatous keratitis. With regard to the general reaction to old tuberculin, he lays less stress on the size of the dose than on the question whether there is any reaction. According to his experience there is no sense in going higher than 5*mg* in children, or 10*mg* in adults. If the patient does not react to this he will not to larger doses, or to the bacillus emulsion. His view concerning the local reaction in the eye is that its absence proves nothing against the tuberculous etiology of the affection present; it may not be present in clinically positive cases of tuberculosis of the iris. Besides the well-known positive local reaction there is a "negative" pallor reaction, which is more frequent in scrofulous, and less common in purely tuberculous, affections. It may appear either together with the positive reaction, or independently.

STRAUB (431, **Ophthalmological contribution to the doctrine of scrofulosis**) says that latent tuberculosis is to be considered the morphological substratum of scrofulosis. Infection in early youth can be overcome, but there remain behind swollen glands which contain living bacilli and necrotic tissue. The absorption of the poison produced by these, causes an intoxication which is disturbing to health, and if tuberculous matter enters the blood, benign metastatic foci in other parts of the body may result. The primary focus has both a bad and a good influence. Although it has provoked the metastatic tuberculosis, it has modified it by giving to the tissues an increased resistance.

GROUT.

LIÉGARD and OFFRET (429, **Wassermann's reaction in interstitial keratitis, irido-chorioiditis, oculomotor paresis, and optic atrophy**) summarize their studies of Wassermann's reaction in 167 patients with syphilitic affections of the eye with the statement that a positive reaction is of extreme value for the diagnosis of syphilis, but that a negative result is of only

limited value. The difference in the results obtained in interstitial keratitis and irido-chorioiditis is very striking; a high percentage of positive reactions was obtained in the former, while the great number of negative results in the latter seem to justify the statements of many writers that syphilis is less often the cause of diseases of the uvea. The exact figures are: 80% positive Wassermann in interstitial keratitis, a figure that rises still higher when all old cases that have previously been treated are excluded; in the category of doubtful cases the large number of positive serum diagnoses (66%) is of special importance. The reaction was positive in 27% of the cases of irido-chorioiditis; it was positive in 69% of the cases of probable or certain syphilis, and in 16% of the cases in which there was no clinical evidence of the disease. A positive result was obtained in 55% of the cases of optic atrophy and paresis of the ocular muscles. Only one negative result was obtained in the cases of manifest tabes, while only 20% were positive in those in which the Argyll Robertson pupil was absent. CAUSÉ.

It has long been known that hookworm disease is often associated with anæmia and œdema of the retina and disk, and with retinal hemorrhages. CALHOUN (424, **Eye complications caused by hookworm disease**) mentions a number of cases of cataract which he thinks were due to the toxins which are generated by the hookworm and cause derangement of the nutrition of the lens.

ALLING.

BOURLAND (423, **Optic neuritis due to malaria**) reports two cases of optic neuritis caused by malaria, each of which ran an exceptionally bad course. The first patient was a soldier of the Foreign Legion, 35 years old, who complained of impairment of vision in each of six attacks of malaria, and finally lost a great part of his vision and had atrophic papillæ. The disease ran a similar course in the other patient, an Arab, 30 years old, who had suffered from many attacks. Bourland thinks that more attention should be paid to the condition of the eyes in malaria than is customary, as the papillitis can then be seen in its early stage and suitable measures can be taken to combat it. It is not as benign in all cases as it has been supposed to be. CAUSÉ.

ULBRICH (433, **Lipæmia**) had a patient, 29 years old, with a high degree of lipæmia. The eyes were externally normal, the media clear, the vision and visual fields normal. In the fundus the arteries appeared to be pale reddish, the veins pale violet, on a red background. The white coloring extended into the finest twigs. On the papilla some of the veins were broad and sheathed with white; no light streak was visible on the veins, on the arteries it was very narrow. The interspaces between the vessels were marbled. The fundus was of its ordinary red color; the macula was of a lively red. The patient was suffering from a grave attack of diabetes. Lipæmia occurs in severe cases of diabetes and is characterized by the appearance of a great quantity of fat and fatty substances in the blood. This is the eleventh reported case, but did not present the highest degree, as the vessels were not quite white. The prognosis is very serious because of the basal disease. Anatomically the vessels are perfectly normal. The minute red lines which border the white vessels are probably due to contrast or shadows; they are not due to diapedesis of blood corpuscles into the adventitia. The veins are without reflexes, probably they are flattened. The reflex from the arteries is narrow; it may be because it comes from the surface of the blood column, while the normal, broad arterial reflex comes from the axial current. The red color of the fundus does not come from that of the chorioidal vessels, but from the pigment epithelium.

In the discussion Lauber remarked that Marx has shown that the light reflected from the fundus corresponds to the spectrum of the pigment epithelium and not to that of the blood.

TERTSCH.

According to ZENTMAYER (437, **Visual disturbances from distant hemorrhage**), visual disturbances occur more frequently in the female, and between the ages of 20 and 50. Usually they appear immediately or within a few hours after the loss of blood. Both eyes were affected in 88%. Optic neuritis, papillœdema, and optic atrophy occur, as well as œdema of and hemorrhages into the retina. He points out the fact that some underlying disease with tissue changes is probably present in the majority of cases. He thinks that retinal ischæmia with

degeneration of the ganglion cells is the most plausible explanation for those cases which exhibit peripheral field contraction, retrobulbar neuritis for those with central scotoma, central lesions for those with hemianopsia, and simple atrophy and postneuritic atrophy for those with marked superior and inferior contractions of the fields. The injection of blood serum in those cases in which blindness is not immediate seems to be the rational treatment. He relates two cases and gives those from literature.

ALLING.

WOLTON (435, **Hemorrhage as the cause of blindness**) relates the case of a man of 58 who vomited a considerable quantity of blood at different times, becoming unconscious after the last attack. It was then found that he had become blind, a condition in which he remained for two weeks. Atrophy of the iris, small, sluggish pupils, and atrophy of both nerves were found. The vision was R. $\frac{1}{8}\frac{0}{0}$, L. $\frac{3}{2}\frac{0}{0}\frac{0}{0}$ General examination revealed myocarditis and general arterio-sclerosis.

ALLING.

KASASS (428, **Pathology of methyl-alcohol amaurosis**) studied the effects produced on the eye by methyl-alcohol poisoning in 40 rabbits. From 2.5 to 6*ccm* to the kilo of the weight of the animal of a 30% solution of methyl alcohol were introduced into the stomachs through a tube. The animals lived comparatively long, one was killed on the 268th day. Specially marked changes were found in the retina, optic nerve, and chorioid. In the retina the changes were to be found in all of the layers, but were most marked in the layer of ganglion cells, where all stages of degeneration could be seen up to total disappearance of the cells, with in many cases a well marked confluence of the granular layers. The retina was very œdematous, and showed a fatty degeneration in the layer of nerve fibers. In two cases the picture seen on microscopic examination was exactly that of an albuminuric retinitis. The fibers of the optic nerve likewise had undergone fatty degeneration, and in addition an interstitial and parenchymatous neuritis was present. Many hemorrhages were to be seen in the membranes of the optic nerve. A fatty degeneration was also found in the oculomotor and sciatic nerves, as well as in the chiasm. The first changes could be observed

in the retina and optic nerve twenty-four hours after the introduction of the alcohol. The construction of the chorioid was so changed as to be unrecognizable. Considerable hemorrhages were present in 14 out of 15 cases, and in 2 there was a detachment of the retina in addition.

The author advances the following theory of the pathogenesis: Under the toxic influence of the methyl alcohol, hemorrhages take place in the envelope of the optic nerve and the chorioid, which have a decided influence upon the circulation of the blood and produce anæmia; the presence of formic acid, a product of the imperfect combustion of the methyl alcohol in the vessels, causes a fatty degeneration. These two factors together with the œdema cause a disturbance in the function of the nerve. These, together with a degeneration of the retina, lead to a rapid amaurosis. As soon as the collateral circulation is established, the œdema passes away and vision is partially restored. The second and final loss of vision is due to a permanent atrophy. The central scotoma is caused by an axial neuritis, the contraction of the visual field by the involvement of the peripheral layers of the optic nerve in the process. He concludes that the optic neuritis may have a parenchymatous and interstitial character, and that, to judge from the entire symptom-complex, the epidemic of poisoning in Berlin in Dec., 1911, is not to be ascribed to a methyl-alcohol poisoning. V. POPPEN.

According to TYSON (432, **Amblyopia from inhalation of methyl alcohol**), thirteen cases of this form of poisoning have been reported. He relates the case of a man who was employed to shellac the interior of beer vats. He always wore gloves. His vision failed to counting fingers in the peripheral field. Optic neuritis and retinal œdema were present. Under treatment he later recovered central vision with contracted fields and atrophic nerves. Two additional cases occurred in women using varnish made from wood alcohol. They complained of headache, dizziness, and obscurations. Their optic disks were blurred and the veins dilated. The symptoms appeared after working in a closed room for a few hours. Tyson believes that denatured alcohol should be substituted for wood alcohol in the arts and trades.

ALLING.

FRIEDMAN (425, **Temporary toxic amaurosis and paralysis following injection of ethyl alcohol into a chronic empyema sinus**) injected 25*cc* of pure alcohol into a sinus connected with a bronchus; his patient immediately became unconscious and later lost his vision, except for light perception, for about an hour. Paresis of the upper and lower extremities was also present. No ophthalmoscopic changes were noted.

ALLING.

WOLTON'S (434, **Quinine amblyopia**) case was an alcoholic who took within four hours 55 grains of quinine and a quart of whiskey. The disks showed atrophy and the vessels were greatly narrowed. The visual fields were contracted for form and color.

ALLING.

POLET (430, **Ocular troubles following affections of the teeth**) finds that infections and inflammations which extend from the teeth to the maxilla may spread to the eye along the veins or nerves by the bony or subperiosteal route. During the first and second dentitions such affections are observed as kerato-conjunctivitis, lachrymation, and spasm of the facial nerve, but these troubles are still more frequent at the time of the cutting of the wisdom teeth. With dental caries have been observed: amblyopia with contraction of the peripheral portion of the visual field, mydriasis, meiosis, disturbances of accommodation, orbital neuralgias, oculomotor paresis, blepharospasm, keratitis, iritis, chorioiditis, and increase of tension. In the course of periostitis may appear: orbital cellulitis, sinusitis, embolism of the retinal vessels, abscess of the frontal lobes with coincident optic atrophy.

DANIS.

III.—GENERAL AND EXPERIMENTAL PATHOLOGY AND TREATMENT. Reviewed by LOEHLEIN.

438. BORBERG, M. C. **Adrenalin and its test.** *Skandinavisches Arch. f. Physiolog.*, xxvii., Nos. 4, 5, and 6.

439. MAYOU, S. **Serum and vaccine therapy in connection with diseases of the eye.** *Annals of Ophthalmology*, October, 1912.

440. MORGENROTH and GINSBERG. **The action of the cinchona alkaloid upon the cornea.** *Berl. klin. Wochenschrift*, 1912, p. 2183.

441. SIMON, J. **The after-effects of neosalvarsan.** *Muench. med. Wochenschrift*, No. 43.

BORBERG (438, **Adrenalin and its test**) describes the numerous chemical (colorimetric) tests for adrenalin, and finds, contrary to the statements of some writers, that adrenalin can be detected with certainty in a dilution of 1:300,000, but not in greater dilutions. This observation, together with the fact that in all of these color reactions the red stain is the same as that produced by the addition of a few drops of ordinary water, or the exposure of a solution of adrenalin to light and air, causes him to think that essentially the same process takes place in all these procedures—namely, the oxidation of the adrenalin and the formation of a reddish combination. He considers the sources of error of the colorimetric methods, the faulty specificity, the slight sensitiveness, the uncertainty of the reactions near the limits of the sensitiveness, and points out particularly how difficult it is to use these tests in organic fluids because of the primary lack of clearness of the latter, their variable colors, the weakness of the sensibility of the reactions usually in the presence of organic material, and the impairment of the reaction by a preceding deposit of albumin. He goes into the reaction in the eye of the frog quite extensively and concludes that the great majority of the investigations made in this manner have been performed under unsatisfactory conditions. He speaks further concerning the behavior of different kinds of frogs, the way of measuring the pupil of the enucleated eye, the probable sources of error, which may explain the contradictory results obtained by former writers, and the specificity of the reaction, its weakening and sensibilization by other materials. By the use of the reaction with the precautions he mentions he obtains the following results: A powerful, positive reaction is always to be obtained in the venous blood of the suprarenal capsules, but nowhere else in the body except in these and their accessory organs. The various pathological conditions in which some authors have demonstrated adrenalin by the frog's eye test, always gave negative results. This seems to be proven conclusively by experimental adrenalinæmia, because it is shown that such a large increase of adrenalin is necessary in order to obtain a positive reaction from the entire blood, that the animal is generally severely poisoned.

MAYOU (439, **Serum and vaccine therapy in connection**

with diseases of the eye) gives a very complete exposition of the history and development of our present knowledge of this method of treatment. His experience has extended over six years. He formerly made use of the opsonic index in grading the dosage, but later found that the eye reactions gave an accurate indication of the dose required. Most of the original investigations have been carried on with tuberculin and staphylococcal injections in the form of vaccines. The ophthalmic diseases treated and his conclusions are as follows: In all cases of styes the injections, generally of staphylococcic vaccines, were successful, especially when autogenous—that is, recurrences were prevented. In chalazion the method was not so satisfactory. In streptococcal infections the treatment must be instituted early and the polyvalent serum was most useful. From his limited experience with gonococcal serum he concludes that this treatment is not superior to the ordinary nitrate of silver method. The treatment of trachoma by the injection of the sterilized conjunctival discharge was without results. He finds jequiritol of value, especially in recent cases with pannus. He relates four cases of scleritis which were treated satisfactorily with tuberculin. In 30 cases of chronic, non-infected uveitis of endogenous origin he found 15 tuberculous, 10 staphylococcal, and 5 syphilitic. In tuberculosis, when the patient has no extensive lesion elsewhere, he administers at first $\frac{1}{1000}$ *mg* of T. R., and increases the dose gradually to $\frac{1}{250}$ *mg*. His results were highly satisfactory. The staphylococcic infections were treated by mixed as well as by autogenous vaccines, but the latter were the more efficient.

ALLING.

In experiments to determine the practical applicability of the chemotherapeutic action of ethylhydrocuprein upon the pneumococcal infection of the cornea in mice, MORGENROTH and GINSBERG (440, **The action of the cinchona alkaloid upon the cornea**) discovered that a total anæsthesia of the cornea was produced by the conjunctival instillation of aqueous solutions of the hydrochlorates of ethylhydrocuprein, hydroquinine, and quinine. They tested this anæsthetic effect carefully by touching the cornea of the spontaneously opened eye of a rabbit with a probe and observing the lid reflex, and found the anæsthesia to be complete in from one to two

minutes after the instillation of a 20 or 10% solution of either of the two former. The anæsthesia produced by a 20% of ethylhydrocuprein was still complete at the end of ten days, and passed off at the end of sixteen days; a solution of hydroquinine of the same strength produced a total anæsthesia that lasted fifteen days. A 1.25% solution of ethylhydrocuprein produced total insensitiveness of the cornea, which lasted from ½ to 1 hour. Solutions of from 0.5 to 0.63% did not always produce total anæsthesia. With 3% solutions of quinine hydrochlorate a total anæsthesia was produced in a minute and a half which lasted an hour; with weaker solutions the effect was less marked. Concerning the after-effects the following may be noted: solutions of the strength of 10 to 20% cannot be used practically, because they almost invariably cause great opacity of the cornea with more or less chemosis. Five per cent. solutions commonly produce at the end of a minute a slight, transient mucous secretion. No after-effects were observed in the rabbit's eye from the use of solutions of 2.5% and upwards. One observation of the authors which is striking is that when they used a 10% oily solution of ethylhydrocuprein they obtained an imperfect anæsthesia and less marked after-effects than when they used watery solutions of the same strength.

SIMON (441, **After-effects of neosalvarsan**) calls attention to the contradictory views concerning whether neosalvarsan is in fact less poisonous than salvarsan. He maintains that those who believe it not to be less poisonous give it in much larger doses, so that no direct comparison can be drawn. In general he thinks that all of the after-effects of neosalvarsan that have been observed were mild and lasted only a few hours, with the exception of two. In one of the latter the clinical picture was identical with the so-called "angioneurotic syndrome," which has been observed repeatedly after salvarsan; in the other the case was one of "acute swelling of the brain" and "medicinal exanthem."

IV.—METHODS OF RESEARCH, REMEDIES, INSTRUMENTS, AND GENERAL OPERATIVE TECHNIQUE. Reviewed by LOEHLEIN.

442. DESCHWEINITZ, G. E. **Treatment of various forms of ocular syphilis with salvarsan.** *Therapeutic Gazette*, May 15, 1912.

443. HOROVITZ. **The influence of cocaine and homatropine upon the accommodation and the size of the pupil.** *Zeitschr. f. Augenheilkunde*, Dec., 1912, p. 530.

444. PECHIN. **Paraplegia following an injection of salvarsan in a patient with hereditary syphilis and interstitial keratitis.** *La clinique ophtalm.*, iv., p. 257.

445. SANTOS-FERNANDEZ. **Mydriasis due to adrenalin.** *Revue générale d'ophtalmologie*, xxxi., p. 433.

446. SANTOS-FERNANDEZ. **Duboisine preferable to atropine in the treatment of diseases of the eye, especially in children.** *Ibid.*, p. 532.

447. SUKER, G. F. **Use of conjunctival flap in perforating wounds of the eyeball.** *Illinois Med. Journal*, Nov., 1912.

DESCHWEINITZ (442, **Treatment of various forms of ocular syphilis with salvarsan**) regards non-inflammatory optic atrophy as a contra-indication, but thinks that the treatment is indicated in specific optic neuritis. His experience has been contrary to that of some who do not believe it to be beneficial in syphilitic interstitial keratitis. The use of salvarsan he has found disappointing in palsies of the ocular muscles.

ALLING.

PECHIN (444, **Paraplegia following salvarsan**) reports a case of this nature met with in a 15-year-old girl suffering from interstitial keratitis due to hereditary syphilis. Intramuscular injections of mercury were first given, and then *20cgm* of neosalvarsan were injected intravenously. No ill effects were noticed at first, but on the sixth day paraplegia appeared with a slight fever, but no premonitory symptoms, as is almost always the case in syphilitic paraplegias. As no other signs of arsenical poisoning were present this would seem to be a neurotropic effect of the drug, which may in time be avoided.

CAUSÉ.

SANTOS-FERNANDEZ (445, **Mydriasis due to adrenalin**) says that the mydriatic effect of adrenalin, which is not seen very often, appears best in eyes that are physiologically normal and not the seat of any kind of inflammatory changes. The mydriasis may be prevented by the simultaneous administration of alypin, and increased by combination with cocaine. The intravenous use of adrenalin is to be avoided, because it is apt to cause atheromatous changes. The application of adrenalin is limited principally to its use in operations. The

mydriasis is probably to be ascribed mainly to the expulsion of the blood from the vascular network of the iris.

CAUSÉ.

SANTOS-FERNANDEZ (446, **Duboisine preferable to atropine**) maintains that the use of atropine should be confined to selected cases, and that duboisine should be employed by preference, especially in children. Atropine has often been observed to have an exciting effect, while that of duboisine is quieting, and it is at the same time less toxic.

CAUSÉ.

In order to clear up the contradictory statements concerning the cycloplegic and mydriatic effect of cocaine and homatropine, HOROVITZ (443, **Influence of cocaine and homatropine upon the accommodation and the size of the pupil**) instituted a series of experiments on students with perfect vision and determined, by the aid of Adam's accommodometer, that cocaine produces a cycloplegia which begins in 5 to 10 minutes, increases rapidly, attains its acme—total paresis—with large doses, in about half an hour, and passes off, as a rule, in two hours. The mydriatic effect reaches its acme a little later, in about ¾ of an hour, and lasts 4 or 5 hours. With homatropine, cycloplegia is noticeable after 10 or 15 minutes, reaches its acme, perhaps total paresis, after about 1½ hours, and ends in about 25 hours; the course of the mydriasis is fairly evenly parallel with that of the cycloplegia. Experiments on persons of different ages confirm the statements of Hess and Treutler that the cycloplegic effect of these drugs is more marked in young than in old people, as in the former the manifest range of accommodation suffers very quickly, while in old persons the latent range of accommodation is first affected and then the still remaining trace of the manifest suffers in sympathy. In the comparative measurements of eyes of different refractions it is striking that a greater range of accommodation is present in myopic eyes than in emmetropes of the same age, an observation that is not in harmony with the greater development of the ciliary muscle in the hypermetropic eye and its constant exercise in accommodation.

SUKER (447, **Conjunctival flap in perforating wounds**) thinks that the Kuhnt flap is useful in corneal fistulæ, corneal

ulcers, corneal and scleral staphylomata, prolapse of the contents of the eye, hernia of the iris, extensive conical cornea, wounds, and as a protection to the cornea in conditions similar to gonorrheal ophthalmia in which perforation is liable to happen.

ALLING.

V.—ANATOMY, EMBRYOLOGY, MALFORMATIONS. Reviewed by PAGENSTECHER.

448. COSMETTATOS. **Congenital remains of the anterior segment of the vascular tunic of the crystalline lens.** *Annales d'oculistique*, cxlviii., p. 241.

449. PETERS. **Congenital staphyloma of the cornea and other malformations of the eye.** *Zeitschrift f. Augenheilkunde*, 1912, p. 604.

450. PLANGE, H. O. **Congenital anomalies of the iris.** *Ibid.*, p. 492.

451. WHITNALL, S. E; **the naso-lachrymal canal; the extent to which it is formed by the maxilla; the influence of this upon its caliber.** *Ophthalmoscope*, October, 1912.

COSMETTATOS (448, **Congenital remains of the anterior segment of the vascular tunic of the crystalline lens**) describes particularly the remains of the membrana capsulo-pupillaris and the membrana pupillaris. Both of these membranes exist during the greater part of intra-uterine life; the former is absorbed during the seventh month, the latter during the eighth. The incomplete absorption of these membranes may cause a great deal of visual disturbance. The membrana capsulo-pupillaris is situated during intra-uterine life between the equator of the lens and the anterior margin of the secondary optic vesicle; remains of it are therefore visible only when the pupil is dilated, and are almost always punctate, white, brown, or light. Pure cases of this kind have been observed only eight times, but the mixed form of membrana capsulo-pupillaris + pupillaris is common. The remains of the pupillary membrane are membranous, filamentous, or punctate. The first two varieties originate from the anterior surface of the iris, either its periphery, minor circle, or free margin, and are inserted into the anterior capsule of the lens. Membranous remains of the pupillary membrane coming from the margin of the pupil are very rare. Punctate remains are to be found on the anterior surface of the lens, more rarely on the anterior

surface of the iris, or floating in the anterior chamber. Only a few cases have been seen in which remains of the pupillary membrane were adherent to the posterior surface of the cornea; Cosmettatos contributes one of these, in which there existed congenitally a filamentous connection between the iris and the cornea, probably due to an incomplete separation of the pupillary membrane from the tissue of the cornea in the third month. In many cases the failure of the pupillary membrane to become absorbed, or to become absorbed completely, is due to an intra-uterine inflammation, in others to a defect of absorption. The variations in the insertion of the pupillary membrane into the anterior surface of the iris depends according to Cosmettatos, upon the size of the cleft which forms in the seventh month between the mesenchym of the iris and the pupillary membrane near the pupil and finally separates them from each other; any disturbance of this development at any place on the margin of the pupil or on the anterior surface of the iris may result in the location of the insertion. Punctate remains on the anterior capsule of the lens are cellular residuæ, while the stellate are probably caused by the insertions of vessels. In both it is supposed that a filamentous connection existed between the pupillary membrane and the anterior surface of the lens which became broken. For the rest there is as yet no satisfactory theory for the genesis of anomalies of the tunica vasculosa lentis, except in those cases that are complicated with other malformations, in which a common cause may be assigned to all of the pathological symptoms.

CAUSÉ.

PETERS (449, **Congenital staphyloma of the cornea and other malformations of the eye**) shows that a defective formation of Descemet's membrane and anterior synechiæ are features that are common to congenital opacities of the cornea and to congenital staphylomata.

PLANGE (450, **Congenital anomalies of the iris**) describes a rare malformation of the anterior mesodermal layer of the iris. It consisted of absence of the pupillary portion of the anterior layer of the iris with a rudimentary development of its ciliary portion, multiple cleavages of the ciliary portion from the retinal under layer, and adhesion to the posterior surface of the cornea in both eyes. The patient suffered also from

cataract and corneal opacity. Her father had a similar malformation.

WHITNALL (451, **The naso-lachrymal canal**) presents a short article based on the study of 50 European skulls. Figs. 1, 3, and 4 illustrate different degrees of formation of the medial wall of the canal by the approximation of the lips of the sulcus lacrimalis of the maxilla. In 7 bones he found a union of these lips which produced a narrowing of the canal. In these cases it is obvious that a slight cause might lead to occlusion of the naso-lachrymal duct.

GROUT.

VI.—NUTRITION AND INTRAOCULAR TENSION. Reviewed by WESSELY.

452. BEHR. **Is there an outflow from the vitreous into the optic nerve in man?** *Arch. f. Ophthalmologie*, lxxxiii., 3.

453. HAMBURGER. **The intraocular flow of fluid.** *Meeting of the Berlin Ophthalmological Society*, November, 1912.

BEHR (452, **Outflow from the vitreous into the optic nerve**) injected five eyes before enucleation with methylene blue, and one with india ink, and enucleated them from ten minutes to an hour later. Unfortunately nothing is said about the pathological changes that rendered enucleation necessary. No trace of the coloring matter was found in the optic nerves, although the vitreous seemed to be stained uniformly. This result leads him to believe that there is in man no outflow from the eye through the optic nerve.

HAMBURGER (453, **The intraocular flow of fluid**) instituted experiments to determine the outflow from the eye under increased pressure, and particularly to learn whether the cicatrix resulting from an iridectomy was specially permeable for fluid. A 2% solution of indigotin-sulphonate of sodium was injected into the anterior chamber and the pressure determined by means of a manometer. The results he obtained showed that normally absorption through the vessels of the iris far surpasses that by way of Schlemm's canal. When the pressure is increased the iris becomes full like a sponge and is then no longer in condition to absorb. Absorption takes place also through the cornea. When an iridectomy had been performed on an eye, the scar left proved to be the palest

portion of the entire circumference of the cornea, the portion that was colored least, showing that the cicatrix, so far from being the most permeable, was the least so for fluid. The difference between the scar and its surroundings was so marked that the coloring matter stopped exactly at its edge. Hamburger concludes that the outflow from the eye is in no way a process of filtration of mathematical constancy in a unit of time, but is a slow absorption, analogous to the outflow from other cavities in the body.

KOELLNER.

VII.—THE SENSE OF SIGHT. Reviewed by KOELLNER.

454. BETTREMIEUX. **Does a hystero-traumatic binocular diplopia exist?** *Société belge ophtalm.*, November.

455. ZEEMANN. **The vision of the one-eyed.** *Klin. Monatsblaetter f. Augenheilkunde*, December, p. 657.

BETTREMIEUX (454, **Does a hystero-traumatic binocular diplopia exist?**) does not try to answer this question with certainty, but reports one case of his own, and refers to several similar ones in literature, in which a binocular diplopia persisted as the only symptom after an accident. His patient received a severe contusion of the left orbit, followed by œdema and ecchymosis of the lids and by paradoxical double images which could not be ascribed to a lesion of any certain muscle. Bettremieux is of the opinion that the diagnosis of a hystero-traumatic diplopia, which is naturally closely related to traumatic neurosis, is justifiable only after all other possibilities have been excluded.

CAUSÉ.

According to ZEEMANN (455, **Vision of the one-eyed**) the vision of the one-eyed differs from the vision of those with two eyes in the following manner: The brightness of objects must be a little less to the one-eyed, though this factor is of no practical moment. In how far the acuteness of vision is reduced, he does not venture to determine. He thinks it possible that the accuracy of fixation and of focussing may be greater with the two eyes, so that the vision is only apparently improved. There seems to be no noteworthy difference between the working power of the one-eyed and the two-eyed. The perception of depth of the one-eyed cannot, he thinks, be

ascribed to the feeling produced by accommodation and convergence, for, according to the researches of Hildebrand and Bourdon, the former has no influence on the vision of depth, and the latter occurs only in the two-eyed. The one-eyed can perceive only the direction of an object, not its distance; this he determines from the changes produced by movements of the head (monocular parallax), and by such secondary aids as shadows, and a knowledge of the size of the object; consequently a certain period of observation is necessary for perception of depth. Experiments show that in a 3 rod test, in which the normal person requires but $\frac{1}{200}$ of a second for positive vision of depth, the one-eyed needs at least $\frac{1}{2}$ a second in which to form a judgment. Hence he concludes that the intellect plays a great part in the adaptation of such men to their callings, and that this must be taken primarily into account in investigations concerning the perception of depth of the one-eyed. Uniformity of the work greatly favors adaptation, so a change of occupation is to be deprecated. No method of measuring the perception of depth of the one-eyed can give information concerning their ability to work.

VIII.—ACCOMMODATION AND REFRACTION. Reviewed by KOELLNER.

456. DUANE. A. **Normal values of the accommodation at all ages.** *Jour. Amer. Med Assoc.*, Sept. 21, 1912.

457. v. ROHR and STOCK. **A method of testing subjectively the effects of glasses.** *Arch. f. Ophthalm.*, lxxxiii., page 189.

458. ROTHEMANN. **Treatment of high myopia.** *Inaug. Dissert.*, Strassburg.

DUANE (456, **Normal values of the accommodation at all ages**) has continued his studies of the normal accommodation and now presents the results of the examination of 1500 cases. The mean values of accommodation at different ages are as follows:

Age 8	13.8
" 12	13.1
" 16	12.4
" 20	11.5
" 24	10.4
" 28	9.4

Age 32	8.3
" 36	7.1
" 40	5.9
" 44	4.2
" 48	2.5
" 52	1.6
" 56	1.2
" 60	1.1

ALLING.

STOCK and v. ROHR (457, **Subjective testing of the effects of glasses**) render one eye ametropic, for example artificially aphakic, by means of Fick's contact glass, and were then able to judge the effects produced by the modern correcting glasses for monolateral aphakia. The results were not unfavorable so far as the correcting glasses themselves are concerned, but the writers emphasize the point that most patients with monolateral aphakia refuse to wear the glass for cosmetic reasons, as the distance between the lenses gives it quite a striking appearance.

ROTHEMANN (458, **Treatment of high myopia**) gives the statistics of Fukala's operation during the past eleven years at the Strassburg eye clinic. Detachment of the retina took place in 3 cases, 9.7%, about the same percentage as that elsewhere obtained. In one case six years elapsed before the beginning of the detachment. In two other cases retinal hemorrhages appeared. He later advises against the operation because it is possible to improve the vision with the telescope lens, with which the results obtained are very satisfactory.

IX.—THE MOTOR APPARATUS OF THE EYES. Reviewed by KOELLNER.

459. BECK. **Nystagmus in fever.** *Wiener klin. Wochensch.*, 46, p. 1831.

460. BROWNE, F. J. and MACKENZIE, J. ROSS. **The etiology and treatment of miners' nystagmus.** *Brit. Med. Jour.*, Oct. 5, 1912.

461. BUTLER, T. HARRISON. **Miners' nystagmus.** *Ophthalmoscope*, Dec.

462. CAESAR. **The judging of concomitant strabismus.** *Vossius' Samml. zwanglos.*, Abhandl. viii., No. 8.

463. CASSIMATIS. **A case of primary divergent strabismus with hypermetropia; some general notes concerning concomitant strabismus in Egypt.** *La clinique ophtalmologique*, iv., p. 517.

464. COURT, JOSIAH. **Miners' nystagmus: a retrospect.** *Ophthalmoscope*, Dec., 1912.

465. CRIDLAND, BERNARD. **Miners' nystagmus.** *Ibid.*, Dec., 1912.

466. DRANSART. **Miners' nystagmus.** *Soc. belge d'ophtalm.* Nov., 1912.

467. ELWORTHY, H. S. **Color and light in relation to miners' nystagmus.** *Ophthalmoscope*, Dec., 1912.

468. HOWE, L. **Measurement of fatigue of the ocular muscles.** *Jour. Amer. Med. Assoc.*, Sept. 21, 1912.

469. LANDOLT, E. **Operations on the vertical muscles of the eyes.** *Arch. d'ophtalmologie*, xxxii., p. 593.

470. LLEWELLYN, THOMAS L. **On miners' nystagmus (neurosis).** *Ophtalmoscope*, Dec.., 1912.

471. MANN. **Galvanic vestibular reaction.** *Neurolog. Zentralbl.*, p. 1356.

472. MARINO. **The theories concerning the mechanism of the associated lateral and convergence movements, studied from the results of experimental investigation by means of transplantation of ocular muscles in monkeys.** *Dtsche. Zeitschr. f. Nervenheilk.*, xliv., p. 138.

473. RUSCHKOWSKY. **Wicherkiewicz' operation of tenotomy of the four recti for sympathetic ophthalmia.** *West. Ophthalm.*, Nov., 1912.

474. USHER. **Case of congenital nystagmus with microscopical examination of eyeballs.** *The Royal London Ophthalmic Hospital Reports*, p. 440.

MARINO (472, **Associated lateral and convergence movements**) instituted experimental researches concerning the centers of the associated movements of the eyes by transplanting the muscles of monkeys so that one muscle took the place of another. He found that convergence took place shortly after a muscle not supplied by the oculomotor nerve, either the superior oblique or the external rectus, had been substituted. This proves that monkeys have neither a supranuclear nor a nuclear center for convergence. In the same way he found that lateral movements took place whether with two interni, with one externus and one superior oblique, with one internus and one superior rectus, or with two externi transplanted. Hence there can be no supranuclear or nuclear center for the lateral movements of the globe in monkeys. His observations covered both the voluntary movements of the eyes, rotation, faradic, and caloric nystagmus, and the effect of experimental faradic stimulation of circumscribed zones of the cortex.

According to MANN (471, **Galvanic vestibular reaction**) the galvanic nystagmus is excited by a current of from 4 to 8 milliamperes. He uses circular electrodes, 4*cm* in diameter, pressed upon the tragus or mastoid. The nystagmus is

usually a mixed horizontal and rotatory, with the rapid component toward the side of the cathode. Ordinarily it is less marked than the caloric nystagmus and appears only when the patients look in the direction of the cathode, while the caloric nystagmus can be seen in whatever way the patient looks. The caloric test is diagnostically the more useful

In a case of congenital nystagmus USHER (474, **Congenital nystagmus**) examined both eyes microscopically in series of sections. The child was 2 years old, the oscillations were 120 per minute, the condition of the eyes otherwise normal. The eyes were placed in formalin 5½ hours after death. The examination revealed an abnormal formation of the macula lutea, in that several layers of well-formed ganglion cells were present everywhere, so that a true fovea was wanting. Apparently an inhibition had taken the place of the normal involution of the retinal layers in question.

It has been observed several times that nystagmus not of otogenous origin may appear in febrile diseases. BECK (459, **Nystagmus in fever**) has collated 56 cases of pneumonia, acute articular rheumatism, etc., in which this has occurred, and finds that there are three types of febrile nystagmus. (1) Most frequently there is a rotatory-horizontal nystagmus when the eyes are turned to the right or left, while the vestibular reaction is normal. (2) Horizontal nystagmus on looking to one side with hyperexcitability to caloric irrigation. (3) In three cases he noticed in caloric irrigation that the rapid component of the nystagmus was absent and there was simply a deviation of the eyeball in the direction of the slow component. The nystagmus was always temporary, *i.e.*, it disappeared as the fever passed away. Concerning the manner in which this symptom is brought about, hyperæmic œdematous conditions are suggested as analogous to the conditions in diseases in the posterior fossa of the skull and to the febrile nystagmus present when there are changes in that region.

The following is an abstract of the papers by BUTLER, COURT, CRIDLAND, ELWORTHY, and LLEWELLYN (461, 464, 465, 467, 470, **Miners' nystagmus**) which formed part of the discussion in miners' nystagmus at the Ophthalmological Congress, Oxford, 1912. Miners' nystagmus is a disease that is peculiar to the coal miner. It usually comes on after several

years' work in the mine, or it may be delayed for 20 to 30 years. The number of miners affected varied with different mines. The cause of this condition is a combination of causes, the most important of which is poor illumination. With a reduced amount of light the fovea is insufficiently stimulated and the eye seeks to place the image on a more sensitive point in the retina. Some of the other causes that have been mentioned are the position of the miner, refractive errors, and inhalation of coal gas. As to treatment, change of occupation will improve the condition, but when the patient returns to the mine the nystagmus increases.

GROUT.

DRANSART (466, **Miners' nystagmus**) considers paresis of the internal recti to be the predisposing factor in the cause of this trouble, for it is demonstrable in 97% of the cases. The wearing of prismatic glasses with their bases in appears to have an influence upon it. In very bad cases advancement may be indicated.

DANIS.

BROWNE and MACKENZIE (460, **Miners' nystagmus**), from the examination of 100 cases, find the following factors to contribute to the production of this condition: (1) Inadequate light; (2) errors of refraction; (3) straining of the extrinsic muscles of the eyeball; (4) neurotic temperament. Treatment consists in having better illumination, correcting refractive errors, rest, and strychnine. GROUT.

CASSIMATIS (463, **Divergent strabismus with hypermetropia**) observed a primary divergent strabismus in a 17 year-old-girl with hypermetropia of both eyes. The squint appeared when she was 11 years old and, at the time of the examination, caused asthenopic troubles. The hypermetropia of the fixing eye was 1.75 D., that of the squinting eye 2.5 D. Abduction was increased, while adduction was very weak; this Cassimatis considers the principal cause of the strabismus. After wearing the proper correction for a month an advancement with tenotomy was performed on both eyes, which succeeded in giving them a faultless position with stereoscopic vision. At the operation, the tendon of the internus of the squinting eye was found to be much weaker than the other ocular muscles.

CAUSÉ.

CAESAR (462, **The judging of concomitant strabismus**) says that strabismus is to be ascribed to a faulty power of fusion, which is either congenital, inhibited during development by an infectious disease, or impaired by the loss of vision of one eye. Treatment consists of (1) correction of the error of refraction, which cannot be done too early; (2) exercise of the amblyopic eye, if one be present; the results of this were negative in 34%, and are the more likely to be negative the older the children; (3) exercise of the power of fusion. The most suitable age for this is between 5 and 10 years. Of the successful cases, fusion was maintained after the lapse of a year or two in 70%. When all conservative measures fail an operation is necessary, but this is not advisable before the twelfth year.

HOWE(468, **Fatigue of ocular muscles**) uses a pair of revolving Crété prisms by means of which any prism strength may be obtained by pushing up a pointer on the handle of the instrument. The elevation of the pointer is recorded on a revolving drum. The subject is requested to state when the images appear double and then the pointer is immediately dropped to zero. He thus produces tracings showing endurance of muscle convergence and divergence and the development of fatigue. He calls the instrument an ophtha mic ergograph, and thinks it will open a new field in ophthalmology.

ALLING.

LANDOLT (469, **Operations on the vertical muscles of the eye**) says that operative interventions on the vertical muscles have less effect than on the lateral, so over-corrections are particularly necessary. In one of the cases he reports, one of resection and advancement of the right superior rectus, a primary over-correction of 4° passed off within a month, leaving binocular fusion; in another, a resection and advancement of the right inferior rectus because of paresis of the superior oblique, an over-effect of 7° had almost completely disappeared at the end of six weeks. In a third case, in which a bilateral paresis of the interni had been obviated by advancement 13 years before, an over-correction of 16° disappeared within a few weeks after resection and advancement of a paretic inferior rectus. Landolt declares that the mathematical regulation of an operation for strabismus is a chimera. He employs advancement exclusively and considers tenotomy to be justi-

fied only on the superior rectus, because this muscle functionates in a field that is used very little, and a defect in excursion here can be easily compensated for by elevation of the head. CAUSÉ.

Five years ago Prof. B. Wicherkiewicz suggested the operation of tenotomy of all four of the recti muscles for cosmetic purposes and to prevent sympathetic inflammation, taking the ground that the pressure of the muscles upon the injured eyeball must produce a nervous irritation which, under certain circumstances, may be reflected to the other eye and set up a sympathetic inflammation. RUSCHKOWSKY (473, **Tenotomy of the four recti for sympathetic ophthalmia**) describes three cases in which he has performed this operation, and comes to the following conclusions: After tenotomy of the four recti the symptoms of traumatic irido-cyclitis pass away, the eye becomes quiet and painless, the symptoms of sympathetic irritation disappear from the other eye, and sympathetic inflammation yields more readily to therapeutic treatment. The good influence upon the eye sympathetically inflamed confirms the ciliary vascular theory of Schmidt-Rimpler. This operation can take the place of enucleation in many cases, excluding of course those in which a neoplasm, a foreign body, or a parasite is present. v. POPPEN.

X.—LIDS. Reviewed by KRAUSS.

475. BRUNETIÈRE. **Contribution to the etiology of acute recurrent œdema of the lids.** *La clinique ophtalm.*, iv., p. 506.

476. TERRIEN and HILLION. **Congenital spasmodic retraction of the upper lid.** *Arch. d'ophtalm.*, xxxii., p. 768.

477. WERNKE. **Anomaly of the upper lid.** *Meeting of the Ophthalmic Society in Odessa*, Oct. 20th.

WERNKE (477, **Anomaly of the upper lid**) found in the outer third of the left upper lid, 3 or 4*mm* above its margin, a funnel-like depression, 3 or 4*mm* in diameter, out of which eyelashes grew. From this place to the upper margin of the orbit extended a bridge, which was very much in the way when an attempt was made to evert the lid. No changes were present in the margins of the lids. The writer is of the opinion that this condition was congenital and of the nature of a coloboma, although the characteristic cleft was wanting. It may be that

the latter had cicatrized and had formed the depression in doing so. V. POPPEN.

TERRIEN and HILLION (476, **Congenital spasmodic retraction of the upper lid**) describe a case of this nature met with in a boy 9 years old, whose eyes were otherwise normal. The cause of the condition was probably a tonic spasm of the levator palpebræ. The palpebral fissure was lengthened horizontally *2mm*, and widened vertically so that about *2mm* of the sclera was uncovered. Graefe's sign was well marked. The upper lid was raised still higher after the instillation of cocaine; the action of pilocarpine was more marked on the affected side, from which it was concluded that the spastic retraction was not caused by irritation of the sympathetic.

CAUSÉ.

BRUNETIÈRE (475, **Etiology of acute recurrent œdema of the lids**) divides this condition into 3 classes: the arthritic, the neuropathic, and the toxic œdema. The first two varieties are well known, while the toxic form has been least observed, although it is the most common. Among the exogenous intoxications, the medicamental (iodide of potash, antipyrin, serum, etc.) and the alimentary are the principal ones. Endogenous intoxications originate chiefly from the gastro-intestinal tract. In this respect recurrent œdema greatly resembles urticaria. CAUSÉ.

XI.—LACHRYMAL ORGANS. Reviewed by KRAUSS.

478. FRENKEL. **Mikulicz's syndrome in a physiological condition.** *Arch. d'ophtalm.*, xxxii., p. 721.

479. TOOKE F. **Polypoidal formation in the lachrymal sac.** *Trans. Amer. Ophth. Soc.*, 1912.

FRENKEL (478, **Mikulicz's syndrome**) shows that Mikulicz's syndrome, swelling of the salivary and lachrymal glands, is not necessarily a pathological symptom, as at least a moderate swelling of one or all of these glands is frequently to be observed under perfectly physiological conditions in the region about Toulouse. He is particularly opposed to the idea that tuberculosis is the cause of Mikulicz's disease.

CAUSÉ.

TOOKE (479, **Polypoidal formation in the lachrymal sac**) in a series of fifty cases of extirpation of the lachrymal sac

found two with definite polypoid formation. In neither case had there been purulent discharge, nor had the canaliculi been slit or probed. The polypi were pedunculated and situated in the neighborhood of the nasal duct.

ALLING.

XII.—ORBITS, INCLUDING EXOPHTHALMOS, ACCESSORY SINUSES. Reviewed by KRAUSS.

480. FEJER. **A case of contralateral atrophy of the optic nerve caused by retrobulbar sarcoma.** *Zentralbl. f. pract. Augenh.*, Nov., p. 490.

481. GINSBURG. **Treatment of pulsating exophthalmos.** *Klin. Monatsbl. f. Augenheilkunde*, Dec., p. 698.

482. GRUENING, E. **Idiopathic hæmatoma of the orbit.** *Trans. Amer. Ophth. Soc.*, 1912.

483. HANDMANN. **Temporary myopia with orbital neoplasms.** *Zeitschr. f. Augenheilkunde*, Dec., p. 542.

484. KNAPP, A. **The Kroenlein operation as an exploratory procedure in affections of the orbit.** *Jour. Amer. Med. Assoc.*, Sept. 21, 1912.

485. POSEY, W. C. **Small round-celled myosarcoma of orbit with extension into the eyeball.** *Penn. Med. Jour.*, April, 1912.

486. POSEY, W. C. **Orbital cellulitis from disease of the superior maxilla in children.** *Jour. Amer. Med. Assoc.*, Sept., 21, 1912.

487. WEEKS, J. E. **Some cases illustrating ocular disturbances due to disease of the nose and accessory sinuses.** *N. Y. State Jour. of Medicine*, Oct., 1912.

488. WEEKS, J. E. **A case of endothelial sarcoma of the orbit.** *Trans. Amer. Ophth. Soc.*, 1912.

489. ZENTMAYER, W. **A case of plexiform neurofibroma involving the orbit.** *Ibid.*, 1912.

GRUENING (482, **Idiopathic hæmatoma of the orbit**) saw a girl of 17 with exophthalmos of the right eye amounting to 15*mm*. The history was that it appeared after an attack of severe pain in the eye accompanied by vomiting. The conjunctiva below the cornea was enormously swollen so that it overlapped the lower lid. Examination with the ophthalmoscope revealed a choked disk. The Kroenlein operation disclosed a sac filled with fluid blood, which was evacuated. The exophthalmos and optic neuritis disappeared.

ALLING.

KNAPP (484, **The Kroenlein operation as an exploratory procedure**) calls attention to the advantages of this operation in diagnosis in morbid conditions of the orbit. The cutaneous incision should be slightly to the outer edge of the periosteal

and bony wound. The periosteum is then carefully raised with a sharp flat elevator and the bony wedge elevated without sacrifice of the orbital margin, so that it may be firmly wedged later to keep it well in place. It is advisable to suture the eyelids as chemosis is likely to follow the operation. Two cases are recorded. The operation in a patient who gave the history of an orbital tumor of one year's duration disclosed a diffuse growth on the outer side and below the eyeball, extending to the apex of the orbit. Being too extensive to eradicate by this method all the contents of the orbit were removed later. The tumor consisted of fibrous tissue with hypertrophy of epithelium-like cells. The other case was one in which a plexiform neuroma of the eyelid had been removed seven years before. An oval tumor was discovered at the apex of the orbit and enucleated entire. It was a fibroneuroma. ALLING.

ZENTMAYER (489, **Plexiform neurofibroma involving the orbit**) found a hemispherical mass in the left temporal region with an extension to the orbit above the eyeball and along the roof of the orbit to the apex. It was composed of medullated and non-medullated nerve fibers in a mass of fat and connective tissue. ALLING.

WEEKS (488, **Endothelial sarcoma of the orbit**) discovered by means of the Kroenlein operation a small tumor 10*mm* by 12*mm* in the apex of the orbit. The considerable amount of exophthalmos present was explained as being due to obstructed circulation. The tumor had developed during eight years, the first symptom being blurring of the vision following a severe blow. ALLING.

FEJER (480, **Contralateral atrophy of the optic nerve caused by retrobulbar sarcoma**) describes a case of this nature. After removal of the eyeball and exenteration of the orbit the vision of the other eye improved to $\frac{5}{30}$, though the projection remained faulty. The visual field became larger, but remained considerably contracted, especially in its outer portion. The pupillary reaction returned and the decoloration of the papilla became less. Examination of the contents of the orbit showed that a sarcoma of the chorioid had broken through the coats of the eyeball and filled the retrobulbar space. The affection of the left eye was doubtless connected with the spread of the

tumor in the right orbit; probably the latter caused a collateral œdema which compressed the left optic nerve and led to a partial degeneration. In what way the œdema extended could not be told, but it is suggested as likely that it was through the accessory sinuses.

Posey (485, **Small round-celled myosarcoma of orbit**) found a tumor mass in the orbit by means of the Kroenlein operation. Thinking that it was malignant the eye was removed and a dense mass of non-pigmented spindle cells was found involving an area of the chorioid and following the course of the vortex veins through the eyeball. The tumor apparently originated as an endothelial sarcoma of the orbit and slowly followed the blood-vessels. It did not seem reasonable that the interior of the eye should have remained so free from involvement if the point of origin had been there.

Alling.

Ginsburg (481, **Pulsating exophthalmos**) has tabulated the results of treatment of 100 cases of pulsating exophthalmos. Ligation of the carotid gave either a cure or improvement in 63.7% of the cases. Bilateral ligation of the carotid is attended by a high mortality. Ligation of the superior ophthalmic vein is rarely performed alone, but usually in combination with ligation of the carotid on the same side, and this is the procedure that has given the best results.

Handmann (483, **Temporary myopia with orbital neoplasms**) describes three cases of orbital affections in which pressure was made upon the globe in such a manner as to cause myopia. In the first case, a girl 12 years old, a myopia of 2 D. changed to emmetropia after the evacuation of an abscess in the inner portion of the upper lid which pressed upon the eyeball. The abscess probably came from the ethmoid. The second case was one of crushing of the roof of the orbit in a boy 14 years old, with the subsequent formation of a soft callus. This tumor pressed the eyeball downward about $\frac{1}{2}cm$ and produced a myopia of 0.5 D. which changed to emmetropia after the tumor had changed into a hard mass, probably because it became a little smaller, although the dislocation of the eyeball was not lessened. In the third case a child 3 years old received a slight blow from a stone on the outer margin of the left orbit. An abscess formed which displaced the eyeball

far to the nasal side. Myopia was distinctly present in this eye, estimated at between 1 and 2 D., but after the evacuation of the abscess and the subsequent healing the skiascope showed the refraction to be emmetropic. In all three cases the other eye was emmetropic or hypermetropic. Handmann thinks that these tumors pressed in such a way upon the walls of the eyeballs as to diminish their equatorial and increase their sagittal diameters.

POSEY (486, **Orbital cellulitis from disease of the superior maxilla in children**) relates two cases showing abscess formation in the lids and cheeks of children 1 and 2 years of age. Both cases proved to be osteomyelitis of the superior maxilla. In neither case was there a history of traumatism, nor any evidence of sinus or nasal trouble. A previous general infection had taken place to which the condition was considered secondary. He points out that in infancy the cancellous structure of the bone largely predominates, rendering it especially liable to inflammatory processes.

ALLING.

Some of WEEKS's (487, **Ocular disturbances due to disease of the nose and accessory sinuses**) cases are as follows: Case of reflex neurosis affecting upper branch of the fifth and branches of the third supplying the sphincter of the iris and the ciliary muscle, from a furuncle on the inner aspect of the ala of the nose. Neurosis with ciliary spasm and cephalalgia induced by pressure of hypertrophied turbinate. Œdema of the orbit and interference with motility as the result of disease of the orbital ethmoid cells. Monocular exudative neuro-retinitis from non-suppurative but septic process in the posterior ethmoid and sphenoid cells with deviation of the septum.

ALLING.

XIII.—CONJUNCTIVA. Reviewed by WOLFRUM.

490. ADAMS, P. H. **A case of Parinaud's conjunctivitis due to animal infection.** *Ophthalmoscope*, Dec., 1912.

491. BRUNS, H. D. **Phlyctenular ophthalmia and its etiology.** *Jour. Amer. Med. Assoc.*, Sept. 21, 1912.

492. GOURFEIN. **Pseudomembranous conjunctivitis of tuberculous origin.** *Arch. d'ophtalm.*, xxxii., p. 693.

493. ISHIHARA. **Relations between perlèche and blepharo-conjunctivitis, both reduced by diplobacilli.** *Klin. Monatsbl. f. Augenh.*, Oct., p. 418.

494. STEPHENSON, SYDNEY. **On the duty of the practitioner in cases of ophthalmia neonatorum.** *Lancet*, Nov. 16, 1912.

495. STERN. **Weakened tuberculosis of the conjunctiva (Parinaud's conjunctivitis.** *Zentralbl. f. prakt. Augenheilkunde*, Nov., p. 321.

496. TSCHIRKOWSKY. **Clinical observations concerning vaccine and serum therapy of diplobacillary conjunctivitis.** *Klin. Monatsbl. f. Augenheilkunde*, Nov., p. 614.

497. WEIDLER, W. B. **Pemphigus of the conjunctiva.** *Jour. Amer. Med. Assoc.*, Sept. 21, 1912.

BRUNS (491, **Phlyctenular ophthalmia**) states that this affection is very common among the negro race and may appear later in life than in the white race. He does not regard the disease as tuberculous or eczematous, but rather as a neuropathic manifestation brought about by auto-intoxication caused by derangement in gastro-intestinal functions. A scrofulous diathesis, as well as poor nutrition, are the predisposing causes. ALLING.

A boy of 7 applied in November to ADAMS (490, **Parinaud's conjunctivitis due to animal infection**) for treatment, with the history that his eye had been swollen for the past week. Examination showed a marked enlargement of the follicles of the conjunctiva with bulbar chemosis. The preauricular gland was large and tender. The bacteriological examination showed the presence of an organism morphologically identical with the Friedlaender pneumobacillus. An examination of the conjunctiva of a dog, who was the constant companion of the boy, revealed the same organism. The patient was confined to bed for one week. His temperature was 102.3°. In Feb. there was a small ulcer on the conjunctiva, but the condition remained practically the same. In the middle of March the preauricular gland was opened; its pus was sterile, but smears from the conjunctiva still contained the organism. After this the eye condition rapidly quieted down and by April most of the follicles had disappeared, but the conjunctiva was of a dirty brown color. Treatment: argyrol and perchloride had no effect. Autogenous vaccine produced a slight local reaction. A 3% solution of methylene blue gave the best results. As regards the bacteriology he believes that the Friedlaender pneumobacillus has not been mentioned before as a cause for this condition. Under these circumstances it is suggested

that this disease is not caused by any specific organism, but is rather a lymphadenitis of the conjunctiva. GROUT.

The case reported by STERN (495, **Parinaud's conjunctivitis**) presented the characteristics of Parinaud's conjunctivitis. The right upper and lower lids were thickened, and granular deposits could be felt. The conjunctiva was covered throughout its entire extent by fairly firm nodules which differed from those of trachoma by their irregular form and the total absence of papillary swelling of the tissue of the mucous membrane. The glands in the right side of the neck were swollen. The benignity of the symptoms confirmed the diagnosis of Parinaud's conjunctivitis. The nodules in the conjunctiva as well as the swellings of the lymphatic glands underwent involution spontaneously in the course of 1½ months. Evidence was obtained that the condition was one of tuberculosis by implantation in a rabbit's eye, which gave a positive result.

GOURFEIN (492, **Pseudomembranous conjunctivitis of tuberculous origin**) adds another clinical picture to those already known of conjunctival tuberculosis. The observation was made on a child 6 years old, whose right eye had been affected 3 days. There was fever with high evening temperature; the conjunctiva of the upper lid was found on eversion to be covered with a false membrane, the rest of the eye was normal. Recovery was complete at the end of six weeks. Inoculation of animals with pieces of the membrane set up general tuberculosis. Diagnostic signs were the form of the fever and the swelling of the neighboring glands, which is almost never absent in conjunctival tuberculosis.

CAUSÉ.

WEIDLER (497, **Pemphigus of the conjunctiva**) tells of a Russian aged 70, who gave a history of failing vision for six months. In the right eye the iris was brown and the pupil sluggish. The lids were thickened and there was total symblepharon, the palpebral fissure being about 8*mm* wide, and the cornea was covered with a thick membrane. The left eye was similarly affected to a less degree. Spots of necrosis developed in the conjunctiva and there was ulceration of the cornea. The disease also affected the mucous membrane of the nose. ALLING.

ISHIHARA (493, **Perlèche and blepharo-conjunctivitis both produced by diplobacilli**) describes perlèche as an eczematous disease of the angles of the mouth characterized by wet, whitish, swollen plaques that are smaller as a rule than the finger-nail. It is usually met with in young people chiefly as a result of uncleanliness, and is common in Japan. Ishihara has invariably found diplobacilli in this disease. Of 28 cases of diplobacillus conjunctivitis, 12 had perlèche. The diplobacilli can be carried from the disease of the mouth to the eye, where they will excite a typical blepharo-conjunctivitis.

TSCHIRKOWSKY (496, **Vaccine and serum therapy of diplobacillary conjunctivitis**) obtained improvement but no cures of diplobacillus catarrh from autogenous vaccines. Polyvalent vaccine was still less efficient. Improvement was likewise obtained from the use of serum. He thinks we must still rely on zinc, but that the best results will be obtained from a combined treatment.

STEPHENSON (494, **The duty of the practitioner in cases of ophthalmia neonatorum**) says that during the passage of the baby's head through the maternal canal infection seldom takes place, as the lids are water-tight and protected by a layer of vernix caseosa. The infective material is usually introduced into the conjunctival sac after birth by winking, or by the child rubbing its eye with a contaminated hand. For this reason, in addition to instilling a 1% solution of silver nitrate, the hands should be thoroughly cleansed at birth and the water that is used in the first bath should not touch the eyes. Treatment: Argyrol, 25%, has given satisfactory results and silver nitrate is resorted to only in stubborn cases. Peroxide of hydrogen in half or full strength is to be strongly recommended.

GROUT.

XIV.—CORNEA AND SCLERA. Reviewed by WOLFRUM.

498. BUCHANAN, LESLIE. **A case of ulcerative keratitis caused by the bacillus of diphtheria.** *Ophthalmoscope*, October, 1912.

499. CLAUSEN. **Etiological, experimental, and therapeutical contributions to the subject of interstitial keratitis.** *Arch. f. Ophthalm.*, lxxxiii., 3, p. 399.

500. DUNN, H. PERCY. **A case of metastatic abscess of the sclera followed by perforation and prolapse of the iris.** *Lancet*, Dec. 14, 1912.

501. GEBB. **Keratitis parenchymatosa after traumatism.** *Deutsche med. Wochenschrift*, No. 49, p. 2337.

502. HAAS. **Change of refraction in a case of interstitial keratitis.** *Annal. d'oculistique*, cxlviii., p. 318.

503. LACOMPTE, FRANZ. **A case of parenchymatous keratitis due to hereditary syphilis following linear extraction of cataract.** *Annal. et bull. de la soc. de méd. de Gand*, Nov., 1912.

504. ORLOFF. **Actinomycosis of the cornea.** *Westn. ophthalm.*, Sept.

505. ROSENMEYER. **The local use of neosalvarsan in the eye.** *Muench. med. Wochenschrift*, No. 45, p. 2459.

506. ROY, D. **Report of six cases of degeneration of the cornea in the same family (nodular keratitis).** *Trans. Amer. Ophth. Soc.*, 1912.

507. TERTSCH. **Keratitis punctata superficialis.** *Ophthalmological Society of Vienna*, Nov. 11, 1912.

508. WEIDLER, W. B. **Keratitis neuro-paralytica after removal of the Gasserian ganglion.** *N. Y. State Jour. of Med.*, Oct., 1912.

BUCHANAN'S (498, **Ulcerative keratitis caused by the diphtheria bacillus**) patient, a laborer 69 years old, applied for treatment saying that his eye had been sore for some weeks past. Examination showed the eyelids to be congested with a moderate amount of secretion, and the palpebral conjunctiva to be congested, but with no membrane. The lower third of the cornea was occupied by an ulcer, the surface of which was slightly raised and composed of a shining yellowish material. The upper part of the cornea was clear, and blood could be seen in the anterior chamber. A scraping of the ulcer was taken and sent to the pathologist for examination, after which the usual treatment for the ulcer was followed, with but little success. Six days later, the report from the pathologist being positive, an injection of 4000 units of antitoxin was given, which brought about a cure. Buchanan believes this case to be of interest as the ulcer was apparently caused by the bacillus of diphtheria. GROUT.

CLAUSEN (499, **Interstitial keratitis**) finds that 90% of all cases of this disease are due to syphilis, while tuberculosis is the chief cause of the remainder. Interstitial keratitis is the result of a disturbance in the nutrition of the cornea produced by a disease of the marginal network of vessels, induced by toxines circulating in the blood. This view is based on the results of experimentally produced interstitial keratitis. The presence of some few spirochætæ may be of no importance, while the disease of the marginal network suspected by v. Michel has been found anatomically by Elschnig. This explains why arsenical and mercurial treatment is of so little

effect in this disease; in place of this a generally strengthening regimen is indicated. Wassermann's reaction is positive in about 80% of the cases, but the syphilitic origin of the disease is not assured by the positive result of the test.

The cornea in ROY's (506, **Degeneration of the cornea**) cases showed various opaque spots which projected slightly from the surface with no inflammatory signs, and occurred in a mother and five children. The greatest number of cases which he has found reported in the same family was three. No treatment is of avail. The cases are exceedingly rare.

ALLING.

WEIDLER's (508, **Keratitis neuro-paralytica after removal of the Gasserian ganglion**) study of the comparative merits of alcohol injections and excision of the Gasserian ganglion show that by the former method the patient is assured freedom from pain for from six months to years. In over 600 cases of the alcohol treatment recorded in the paper there was only one having serious keratitis, whereas in 70 Gasserian operations keratitis followed in a considerable number and enucleation was necessary in some. ALLING.

ORLOFF's (504, **Actinomycosis of the cornea**) patient complained of pain and impaired vision in the left eye. A year and a half before he had been struck in the eye by a clod of earth thrown from a horse's hoof. In the lower inner quadrant of the cornea, midway between the center and the margin, could be seen a slightly elevated, white neoplasm with a brownish stain. It was about *2mm* in diameter, and was sharply differentiated in its structure from the cornea. There was an insignificant pericorneal injection, with slight photophobia and lachrymation. The vision of the left eye was 0.8, of the right normal. Diagnosis: keratomycosis of the left cornea. The threads of actinomycosis could be seen with the microscope, together with white staphylococci. Cultures of this fungus were injected into the cornea, but proved weakly virulent. Injections into the anterior chamber gave results that varied according to the method of procedure. The introduction of a colony visible to the naked eye into the eye of a rabbit or dog excited an iritis which passed away in four or five weeks. The clinical picture was quite different in another case. The patient got some hay dust in her eye, the sight of

which gradually failed. In the center of the cornea could be seen a superficial, blue red wound, $1\frac{1}{2}mm$ in diameter. Its margins were sharply defined, and it was deepest at the periphery, while its center looked like a blunt cone. There were almost no symptoms on the part of the iris. Cultures revealed the same kind of actinomycosis as were present in the first case. Hence the author concludes that the same agent may excite two kinds of actinomycosis, an ulcerative and a mycotic, in which the tissue defect is covered by a layer of fungous threads and the necrotic portions of the cornea. It is also possible that the ulcerative form is a later stage of the disease and is produced by a casting off of the necrotic focus.

V. POPPEN.

TERTSCH'S (507, **Keratitis punctata superficialis**) patient, a man 25 years old, had suffered a long time from a congestive catarrh when spots appeared on the cornea that constantly changed their place and size. In the left eye these spots were arranged in a circle in front of the pupil, sending rays into the periphery. The surface over the spots was smooth and lustrous. In spite of the spots, which were of a bluish white, the vision was normal, so they must have been perfectly transparent. Tertsch ascribes them to œdema in the most superficial layers of the cornea, and thinks they must have been due to infection, although the bacteriological examination was negative.

In the discussion Kraemer mentioned a case with striæ which Fuchs thought to be infiltrations along the nerves. The striæ disappeared leaving no trace. The disease appears after a conjunctivitis, or after transparent blebs on the cornea that last several days. It commonly recovers without treatment. Meissner has observed that the disease is particularly apt to occur after a conjunctivitis that has been treated with silver. Reuss discussed the course of the disease which usually starts from a catarrh which shows a certain intolerance to silver. The appearance of the spots is not a result of the treatment. They may occur with eczematous keratitis, or without any preceding disease, and set in with photophobia, pain, and lachrymation. He has often noticed the changes in the position and size of the spots. Kraemer remarked that he had seen the disease after cases of conjunctivitis that were

not treated with silver. Tertsch had made the same observation as Kraemer. He claimed that four forms of keratitis punctata superficialis should be differentiated: (1) after a congestive catarrh; (2) after herpes of the cornea; (3) the miliary eruption of phlyctenulæ; (4) after a purulent conjunctival catarrh in which the eye had been tied up for a long time.

TERTSCH.

LACOMPTE (503, **Syphilitic parenchymatous keratitis following extraction of cataract**) observed the commencement of an interstitial keratitis three days after a cataract extraction in a girl 15 years old. He agrees with Antonelli that the localization of the morbid agent or toxine in the cornea is favored by the diminution of the power of resistance induced in the tissue by the traumatism. DANIS.

GEBB (501, **Keratitis parenchymatosa after traumatism**) reports a case in which an interstitial keratitis followed a traumatism after an interval of 14 days.

In the course of an interstitial keratitis HAAS (502, **Change of refraction in a case of interstitial keratitis**) observed a marked change of the refraction, in which a myopia that had previously existed was transformed into emmetropia. He thinks that this resulted from a flattening of the cornea, and not from the relaxation of a spasm. The patient was a young man.

CAUSÉ.

ROSENMEYER (505, **Local use of neosalvarsan**) instilled a 2% solution of neosalvarsan into the eyes of a patient suffering from interstitial keratitis, and obtained an improvement and retrogression of the symptoms.

DUNN (500, **Metastatic abscess of the sclera**) reports a case in which a yellowish swelling that resembled an ordinary phlyctenule appeared in the limbus two weeks after the opening of a hæmatoma that became infected. The eye was normal in other respects. The swelling gradually increased in size and ruptured two weeks later. A prolapse of the iris, which occurred, was excised. Good recovery.

GROUT.

XV.—IRIS AND PUPILS. Reviewed by NICOLAI.

509. HEINE. **Tuberculosis and tuberculin.** *Med. Klinik*, No. 44–45.

510. KRAEMER. **Congenital cyclic disease of the oculomotorius.** *Vienna Ophthalmic Society*, May 20, 1912.

511. SUKER, G. F. **Primary melanosarcoma of iris followed by extensive metastatic melanosarcoma of the liver.** *Illinois Med. Jour.*, Oct.

512. WEEKERS. **Pupillary reaction produced by adrenalin in meiosis due to paralysis of the ocular sympathetic.** *Arch. d'ophtalm.*, xxxii., p. 610.

SUKER'S (511, **Primary melanosarcoma of the iris followed by extensive metastatic melanosarcoma of the liver**) patient was a woman of 29 who presented a small black spot on the iris after pregnancy. It was removed by iridectomy. It recurred in about two years, grew rapidly, and was again excised. A year later enucleation was performed. Six years from the original observation there was a recurrence in the socket; the orbit was completely exenterated and the sinuses cleared. Six months later a large nodule appeared in the orbit, and an exploratory incision over the liver showed the latter organ to be studded with bluish-black nodules. The patient died soon after.

ALLING.

HEINE (509, **Tuberculosis and tuberculin**) says that there are several kinds of nodules of the iris which may be considered clinically typical of tuberculosis in the absence of any other etiology, such as syphilis, and the reaction to old tuberculin is positive. The first of these are the little gray, bright glassy nodules in the minor circle of the iris; the second, tumor-like, roundish thickenings of the stroma near the margin of the ciliary body; the third, more inflammatory infiltrations in the region of the minor arterial circle of the iris. Among the atypical signs of tuberculosis of the iris and ciliary body he mentions deposits on Descemet's membrane, with sometimes a very slight heterochromia when the iris is caused to appear somewhat brighter as the result of a slight atrophy. When these deposits are present, every means should be tried to determine whether other signs of tuberculosis are to be found. In the second part of his article the author considers the value of the specific reactions for diagnosis. The general reaction is considerable and more characteristic than the local, the absence of which proves nothing against the presence of tuberculosis. Not alone the temperature but the pulse and the general disturbances are of importance.

KRAEMER (510, **Congenital cyclic disease of the oculomotorius**) reports two cases of a pupillary phenomenon that

has been described as the jumping pupil (springende Pupille). The first patient was a man 21 years old, who had had since his fifth year total paralysis of his right eye with ptosis. He had been operated on for ptosis and strabismus without benefit. His left eye was perfectly normal. The diameter of his right pupil fluctuated in regular intervals between 8.5 and 3*mm.* There was no reaction to light or convergence. The second patient was a girl 15 years old who had had from birth a paresis of the right oculomotorius. The condition was similar to that in the first case. At the moment of contraction the upper lid lifted so that the palpebral fissure became wider than the other, and the angle of strabismus became less. This phenomenon had existed in the first patient before the operation. In both cases the dilatation of the pupil was slow, taking four seconds, the contraction sudden after some twitchings in the pupil. Observations were made of the time of the two phases when the patient looked in different directions, in various degrees of illumination, and of the influence exerted upon them by drugs. Closure of the lids seemed to arrest the dilatation. Pilocarpine diminished the mydriasis; eserine effected a strong contraction, yet was without influence on the duration of the phases; atropine paralyzed the contraction.

WEEKERS (512, **Pupillary reaction produced by adrenalin in meiosis due to paralysis of the ocular sympathetic**) reports three observations of a characteristic reaction of the pupil to the instillation of adrenalin in meiosis due to incomplete paresis of the sympathetic. In these cases the dilatation of the pupil caused by cocaine is not marked, or the difference from the sound side is only quantitative, while adrenalin dilates the pupil only when there is a lesion of the sympathetic. Hence this is a direct, pathognomonic, specific reaction. Weekers instilled one drop of the ordinary solution of adrenalin in each eye every five minutes; half an hour after the first drop had been instilled the pupil of the diseased eye was dilated, while that of the healthy one was unchanged. Doubtless there is a certain antagonism between the action of the adrenalin and the irritation of the sympathetic. The intravenous injection of adrenalin into animals produces a dilatation of the pupils, while the sympathetic when healthy inhibits the dilatation of the pupil when a small quantity is absorbed from the

conjunctival sac; the dilatation can take place only when the nerve is diseased. The effect on the pupil is greater or less in proportion as the paresis of the sympathetic is more or less complete. It seems to be certainly due to a direct stimulation of the smooth muscles.

CAUSÉ.

XVII.—Die Angiomatose der Retina. (von Hippelsche Krankheit.) (Angiomatosis of Retina.) Sammlung zwangloser Abhandlungen auf dem Gebiete der Augenheilkunde. By Professor A. Vossius, Giessen. Vol. IX., No. 1. Halle, C. Marhold, 1913. Price 1 Mark.

In this monograph the author gives a complete description of this rare affection. In twenty-two years and in about 100,000 patients Vossius has observed it only twice. The first case has been described by Fuchs in 1882, later on cases have been published by Magnus, Schleich, and others. But not until in 1911 when von Hippel was able to make a microscopical examination of an affected eye was the true nature of the disease revealed. In all, only twenty-two cases are reported. The disease consists in the main in the formation of true angiomata in the fundus; arteries and veins are greatly dilated, very tortuous, sometimes forming regular loops, and almost equal in color, so as to make it very difficult to differentiate between veins and arteries. As a rule they terminate in a reddish swelling, which microscopically proved to consist of a convolute of capillary vessels forming a regular network. Sometimes this area is prominent and in the shape of a berry. In the macula the formation of a star-figure is frequently observed, resembling an albuminuric retinitis, due to the presence of fat cells. In the course of this very chronic affection the retina degenerates, detachment follows, secondary cataract and shrinking of the eye terminate in blindness. The course of the disease extends over many years, from ten to fifteen, usually attacking people in their second or third decade.

The first of the cases reported by Vossius is that of a man

twenty-three years old. Vision of right eye: fingers at 2–3 meters. Left: normal. Strabismus divergens, with crossed diplopia. The anterior bulbus showed no changes. In the vitreous there were a few floating opacities. Veins enormously tortuous, arteries could be seen only with difficulty. Veins dilated to three or four times their normal caliber and so pale that they could easily be mistaken for arteries. The papilla was pale, its outlines indistinct. Between the blood-vessels were numerous white spots, such as are seen in retinitis albuminurica. Looking up, the retina looked blurred and whitish, and the very much dilated and tortuous blood-vessels could readily be seen, also round, bright red spots, which almost looked like hemorrhages. One very thick vein could be followed into one of these spots. After one month's stay at the clinic the picture was about the same, only clearer. The formation of loops and the termination of the veins in the red areas could very plainly be seen. In the left eye similar but only incipient changes had appeared. Later inquiries revealed that the patient was alive but blind for a number of years.

The second case is that of a girl, twenty-three years of age; she was the fourteenth of sixteen children. Some time in August, 1911, patient complained about severe headaches. A few days later she noticed a glimmering in her right eye and the following day that she could not see well. The left eye was defective through an injury received in childhood. In the right eye the following status was recorded: Papilla normal, except that the inner and lower margin was slightly blurred. The vessels of the lower fundus, also of the upper and nasal side, were normal. The superior temporal arteries and veins were swollen and tortuous. Both were bright red, with a broad reflex stripe. The artery, which showed an unequal dilatation, terminated in an egg-shaped balloon, of about four times the diameter of the papilla. The upper branch of the vein likewise disappeared in it, having first described a complete loop. In the region of the macula were many little, white stripes and dots, such as in albuminuric retinitis, but a regular star-figure was absent. After four months no change had been observed.

The fact, that the arteries and veins look so very much

alike, is probably explained by the anatomical findings. In the arteries as well as in the veins, von Hippel found a thickening of the intima and also of the adventitia and partly a wasting of the muscularis, so that even under the microscope a differentiation of the blood-vessels was difficult. The red areas, which first were mistaken for aneurisms, proved to be superficial angiomata, consisting of a mass of capillary blood-vessels with a foundation of glia tissue.

The cause of the disease is not known. It may be congenital, which assumption is substantiated by the observation of the affection in children of the same parentage.

SCHALCK.

XVIII.—Eyestrain in Every Day Practice. By SYDNEY STEPHENSON, Ophthalmic Surgeon to the Queens Hospital for Children, London. Editor of the *Ophthalmoscope*, London. The Ophthalmoscope Press, 24 Thayer St., 1913. Price 3s. 6d. net.

A man of Stephenson's reputation often considers an article on such pseudo-scientific a subject as eyestrain as rather unworthy of his efforts. But Stephenson has been so convinced, by increasing years and wide experience of the intimate connection between eyestrain and many so-called reflex neuroses, that he has collected together into a small volume a series of previous contributions on various phases of the subject, to the end that he may do his share toward convincing his colleagues of its importance.

His point of view is that of an open-minded conservative, and we can commend the little book not only to the general practitioner who wishes to form an intelligent opinion on the question, but to the ophthalmologists who think to account for all human ills through eyestrain and the neurologists who occasionally deny its very existence.

Stephenson is sure that eyestrain is more apt to manifest itself in persons who have inherited or acquired an unstable nervous system; in fact he thinks this element dominates the entire question. Women and children being more highly strung and physically weaker than men are more apt to suffer, while people who use their eyes habitually for close work are especially prone to it. No one questions to-day the close

connection between eyestrain and many chronic headaches, but its association with migraine is not so undisputed. In Stephenson's experience this connection is so intimate and constant that he urges the reader to be very chary of accepting the opposite view. He has come to consider spectacles an essential part in the treatment of most habit spasms though he is far from asserting that they will cure every case. Like the rest of us he has seen occasional cases of eyestrain simulating organic disease of the nervous system but on this score he is very conservative. He is sure that strain is more likely to occur when the error is small enough to be mastered by the ciliary muscle for the time being and that no authoritative opinion or correction can be made without full cycloplegia. While not intended to be exhaustive the book contains numerous references to significant contributions which make it a very adequate review of the whole subject.

E. M. ALGER.

XIX.—Diseases of the Eye. By GEORGE E. DE SCHWEINITZ, M.D., Professor of Ophthalmology in the University of Pennsylvania. Seventh Edition. Thoroughly Revised. Octavo of 979 pages, 360 text illustrations, and seven lithographic plates. Philadelphia and London: W. B. Saunders Company, 1913. Cloth, $5.00 net.

The appearance of a new edition of this standard American text-book of ophthalmology calls for comment principally to note the new matter which has been added. The new subjects are: Schiötz's Tonometer; Ophthalmodiaphanoscopy; Sporotrichosis of the Eyelids and Conjunctiva; Widmark's Conjunctivitis; Rosacea Keratitis; Epithelial Dystrophy of the Cornea; Marginal Degeneration of the Cornea; Blue Sclerotics; Progressive Atrophy of the Iris Layers; Exudative Retinitis (Coats' Disease); Angiomatosis Retinæ (von Hippel's Disease); Cysts of the Retina; Blindness from the Aryolarsenates; Siegrist's Method of Local Anæsthesia; Simple Trephining of the Sclera (Elliot's Operation); Reese's Muscle Resection Operation; Toti's Operation (Dacryocystorhinostomia). Attention is also drawn to vaccine treatment, to salvarsan, and to the bacterial (septic) origin of iritis and uveitis.

The eminent author is to be congratulated upon the judicious selection and critical presentation of the advances in recent years which bring to many excellent points of the book the feature of being quite up-to-date.

A. K.

XX.—The American Encyclopedia and Dictionary of Ophthalmology. Edited by CASEY A. WOOD, assisted by a large staff of collaborators. Fully Illustrated. Volume I., A to Azoviolett. Pp. 727. Chicago: Cleveland Press, 1913. Price, cloth, $6.00 per volume.

The prompt appearance of the first volume of this monumental work reflects great credit upon its indefatigable editor and his collaborators. The arrangement of the subjects is alphabetical. The book is also a dictionary of words and phrases in English, Latin, French, German, and Italian, which are of use to the student of ophthalmology.

Some of the longer articles are: After-Cataract, by Myles Standish; After-Treatment of Ophthalmic Operations, by E. C. Ellett; Ali Ben Isa, by T. M. Shastid; Alphabets and Literature for the Blind, by F. Park Lewis; Anatomy (Gross) of the Human Eye, by A. N. M.?; Anæsthesia in Ophthalmic Surgery, by Wendell Reber; Arc Lights and Their Effect on the Eye, by C. A. Wood; Aristotle, by T. M. Shastid; Artificial Eyes, by C. A. Wood.

The many subjects and terms described show the enormous task which the author has undertaken and is apparently solving with success. The convenience of a reference book of this character is of course apparent. The book-making and illustrations are excellent. We look forward with great pleasure to the rapid appearance of the remaining volumes.

A. K.

XXI.—Julius Hirschberg's Ausgewählte Abhandlungen (Selected Papers) (1868–1912). Presented on the occasion of his 70th birthday in the name of his pupils by Oscar Fehr and Wilhelm Mühsam. With illustrations and a portrait. Pp. 864. Leipzig. Veit & Co., 1913. Price, 30M.

This publication of Professor Hirschberg's writings in a single volume has its inception from the German custom, of honoring a noted scientist on the occasion of his 70th birthday.

The book furthermore gains in interest from the fact that Professor Hirschberg has made the selection of his writings himself. The articles have been grouped according to their contents under the following headings: I.—Relation of the Eye to General Diseases; II.—Operations on the Eye; III.—Diseases of the Eye and their Treatment. A glance at the subject index shows how completely the entire clinical field of ophthalmology has been covered, and one cannot help but marvel at the enormous literary labor expended. It must be a great satisfaction to the author to see the large volume which the collection of these papers makes, especially as the subjects are always important and the form of expression is concise, a feature which is unfortunately not generally a characteristic of German scientific writing. We sincerely hope that the eminent author will continue to contribute to ophthalmic literature for many years to come.

A. K.

XXII.—The Ophthalmic Year-Book. Volume IX. Edited by Dr. E. JACKSON, assisted by T. B. Schneideman, W. Zentmayer, W. H. Crisp, C. A. Wood, W. Reber, H. S. Gradle, R. H. Elliot, H. W. Aufmwasser, and M. Wiener. Illustrated. Pp. 518. Herrick Book and Stationery Co., Denver, Colo. 1913. Price, $5.00.

It is a great pleasure to welcome the reappearance of the Year-Book. The present volume gives a digest of ophthalmic literature for 1911 and 1912, so that there is no interruption in the series. Only papers of importance have been reviewed. It is now published with assistance from the Knapp Testimonial Fund of the Section on Ophthalmology of the A. M. A. The importance of keeping up with the literature is so evident and the task is so facilitated by these reviews that Dr. Jackson's year-book should be a much-used occupant of every ophthalmologist's library.

A. K.

XXIII.—The Accessory Sinuses of the Nose: their Catarrhal and Suppurative Diseases. By Dr. ROSS HALL SKILLERN, of Philadelphia. Copiously illustrated. Pp. 389. Philadelphia & London: J. B. Lippincott Co., 1913. Price, $5.00.

The importance of the nasal accessory sinuses is no longer

questioned, though a thorough treatment of their disorders had not been written in the English language until the appearance of Dr. Skillern's book. The author treats his subject first, by an excellent presentation aided by many illustrations of that most difficult subject, the anatomy. This is especially of the greatest importance to the ophthalmologists whose estimation of orbital conditions depends so much upon the correct knowledge of the topography of the adjoining nasal cavities. The etiology, pathology, symptoms, diagnosis, and complications of sinus disease conclude the heading of general considerations. In the second or special part each sinus is taken up in turn with reference to anatomy, etiology, symptoms, diagnosis, and treatment. The orbital complications, the relationship of the optic nerve to the posterior ethmoidal cells, the frequent association of ethmoiditis and lachrymal disease are fully described. The book, in short deserves the careful study of every ophthalmic surgeon desirous of information on the relation of the nose and the eye.

A. K.

XXIV.—Diseases and Injuries of the Eye. A Text-book for Students and Practitioners. By Dr. W. G. SYM of Edinburgh. Crown 8vo, cloth, with illustrations in color and in the text. Pp. 493. The Macmillan Co., 64 Fifth Ave., New York. 1913. Price $2.50 net.

This is an excellent and well-balanced short text-book on the eye, adapted for the purposes of students and general practitioners. It is written in an original and attractive manner by an experienced clinician. We are glad to see that the author favors the routine examination of refraction without a mydriatic. The text is illustrated by a sufficient number of illustrations, and the color pictures of external diseases and fundus conditions are excellent. The book is a worthy addition to the group of short text-books in English on the eye and it is a pleasure to recommend it.

A. K.

XXV.—Prisms: Their Use and Equivalents. By Dr. JAMES

THORINGTON of Philadelphia. 118 illustrations. Pp. 144. Philadelphia, P. Blakiston's Son & Co., 1012 Walnut St., 1913. Price, $1.50.

In addition to the optical properties of prisms their use is described in the diagnosis and treatment of muscular imbalance of the eye. The book is a fitting companion to the author's well-known books on refraction and enjoys the same clearness of definition.

A. K.

MISCELLANEOUS NOTE.

The NEW YORK OPHTHALMIC and AURAL INSTITUTE of 44 and 46 East 12th St., New York, which was founded by Dr. Herman Knapp, in 1869, will move on October 1st to 57th St. and 10th Ave., where a new fire-proof hospital building has been erected. The new hospital will be given over solely to the treatment and study of eye diseases; the other departments will be discontinued. The name of the new hospital will be the *Herman Knapp Memorial Eye Hospital.*